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GENERAL SIR DANIEL LYSONS, K.C.B., Quartermaster-General, in the Chair.

THE MARCH FROM THE INDUS TO THE HELMUND AND BACK, 1878, 1879.

By Major-General SIR MICHAEL A. BIDDULPH, K.C.B., R.A., &c., &c.

The CHAIRMAN: I regret very much to have to inform you that His Royal Highness the Duke of Cambridge is unable to attend to-day, having some other pressing engagements, from which he could not absent himself. I have now the pleasure of introducing to you Major-General Sir Michael Biddulph. I need hardly say how well qualified he is to deal with the subject he has undertaken, but I should tell you that he has drawn up the paper which he is about to read under some difficulties. He has had very short time to prepare it, and undertook to deliver his lecture at the particular request of the Institution, and has done his best to make it as interesting as possible.

AT the invitation of the Council, I give here a sketch of my experiences of the march of the columns commanded by me to the Helmund and back to the Indus.

I divide the subject into the following parts, observing that the time and space available is so limited that the observations on each must be confined to the shortest descriptions:—

Part 1. The Geographical and Physical Character of the Country—Roads.

Part 2. Baluchistan—Kelat State—Events which led to British occupation of Quetta—Tribes.

Part 3. The March to the Helmund.

Part 4. The Return March to the Indus.

PART 1.

THE GEOGRAPHICAL AND PHYSICAL CHARACTER OF THE COUNTRY—ROADS.

The country traversed by columns under my command, or to be mentioned in this study, lies between longitude 72° and 64° East, and latitude 28° and 32° 12′ North.

The parallelogram so enclosed is about 450 miles long by 320 miles wide.

The western frontier of India is for a length of 600 miles bounded by Baluchistan and territories inhabited by Baluch tribes, and for 300 miles Baluch country intervenes between our border and Afghanistan.

The plains of the Punjab and of Sind run along the boundary of Baluchistan, and at a distance of from 50 to 20 miles the River Indus pursues a course as far down as Mithunkot from north to south, and then winds south-west through a country similar to that of Egypt. A belt of cultivation and verdure is found along the margin of flood and irrigation, and beyond that, the desert.

If we could in one view behold the aspect looking westward from the right bank of the Indus where its course is north and south, we should see a line of hills called the Eastern Sulimani, extending as a continuous rampart, with the plains running up to the foot of the range. We should note that this line of hills, having an elevation of 11,000 feet at the Takt-i-Suliman and of 7,400 near Fort Munro, opposite Dera-i-Ghazi-Khan, gradually diminishes in height, is broken, and dwindles away till it is lost in the plains near Kusmore, at a point 12 miles from the Indus.

The strip of lowland country on the west bank of the Indus up to the foot of the hills is called the Derajat. It is cut up and broken by torrents, the beds of which are generally dry wastes, and the country is, except at a few places where permanent water is found, altogether sterile and hot.

If in like manner we view the physical aspect looking north and north-west from Jacobabad, we notice a wide bay of plains extending between the broken spur of the Sulimani and a second line of hills, having a direction parallel to the outer range.

This plain, which is called the Kachi, extends in an even surface for 150 miles from the Indus at Sukkur, and is bounded on the north by successive spurs lying between the two great ranges.

The Kachi, thus bounded by barren hills on all sides but the south, is one of the hottest regions in the world. Except where subject to inundations, or within reach of irrigation, it is completely sterile—a hard clay surface called *Pāt*—and this kind of country extends round to the east of the spur of the Suliman into the Derajat country. Subject to terrific heats and to a fiercely hot pestilential wind, the Kachi is at times fatal even to the natives.

The broken projection of the Suliman, in which lie Kahun and Dera, the chief towns of the Maris and Bugtis, partakes of the heat and sterility of the surrounding *pāt*, and water is here scarce. The extremity of the range is intersected by sandy desert nullas. Higher up there are a few valleys, where water renders cultivation possible, and the verdure increases in the parts furthest removed from the hot margin of plains. The broken character of this part of the range gives a step-like configuration; plateaux, divided by ridges, rise one above the other till the high plains and vales of Vatakri, Barkhan, Rakni, Bori, and Zhob are eventually reached.

The range bounding the Kachi to the westward is a continuous wall, with imperceptible breaks only, and it bears the local names of Gindari, Takari, and Kirthar. Through this uniform rampart there are

two notable rents or defiles, viz., the Mulla or Miloh, opening opposite Gandava, leading to Kelat, and the Bolan entering near Dadur, leading to Quetta, Kandahar, and Herat. The Bolan is an abrupt defile—a rent in the range—the bottom is filled with the stony pebbly bed of a mountain torrent. This steep ramp forms for 60 miles the road from Dadur, elevation 750 feet, to the Dasht-i-Bedowlat, elevation 6,225 feet. This inhospitable plateau and the upper portion of the Bolan are subject to the most piercingly cold winds and temperature, and the sudden change from the heat of the Kachi to the cold above is most trying to the strongest constitutions. The journey in the reverse direction is no less difficult to bear. Notwithstanding, however, the difficulties of the road, the absence of supplies, wood, and grazing, and the hostile character of the predatory tribes around, this route has been always most in favour as the great commercial and military communication from Persia, Central Asia, and Khorassan, to India.

Once the Dasht-i-Bedowlat is reached, no mountain range need be crossed between it and the Khoja Amran. From here plains lead on to plains by wide passages. The Dasht-i-Bedowlat itself is an isolated and singular basin, having no outlet for its drainage. To the north there is an open pass over the skirt of Murdar into the Shallkot Valley, in which Quetta stands. To the eastward a wide kotal leads to Mustung, where an open vale branches out in several directions.

But to understand the configuration of the country between the Eastern Suliman and the Khoja Amran, it will be best to view it in imagination, as we are now able to represent it in our maps, taking standpoints on the Kand Peak, on Surghwund, on Muzwah, Takatu, and Murdar, all of which are prominent elevations of the offshoot of

SKETCH PLAN TO EXHIBIT WATER-PARTING RIDGE CONNECTING EAST SULIMANI TO THE WESTERN SULIMANI. NO SCALE.

the Safaid Koh, which has been arbitrarily but conveniently designated "the Western Sulimani Range."

The Western Sulimani is the great feature which, with its arms, forms the framework of the whole country from the Indus to within a short distance of Kandahar. Running with a direction south-west, it divides the Kakur valleys and plateaux, which radiate from its eastern slopes from the group of vales which go to form the Shallkot and Pishin plains. A water-parting ridge stretches eastward from the neighbourhood of the Kand Peak, and is produced towards the Eastern Sulimani, which with this ridge causes this spur to assume the form of a ⊣, as shown on previous page.

The Western Sulimani, after bounding Pishin and Shallkot on their eastern border, runs in a southerly direction, supporting Kelat, and it eventually is lost in the sea at Cape Monze. Continuing our study in a more detailed manner, we observe that the Eastern Shall Valley, which opens from the Dasht-i-Bedowlat, has a direction due north from the water-parting of Sir-i-ab, and spreads into a wide plain, in the midst of which Quetta stands, well removed from the mountains. Between Murdar and Takatu, we note that there are two passes leading beyond the screen of mountains into a country which was in 1878 a *terra incognita*. Of these the Hunna pass rises to a water-parting of the Nari or Sibi drainage, and the Surkhwulla pass to a water-parting of the Kakur Lora.

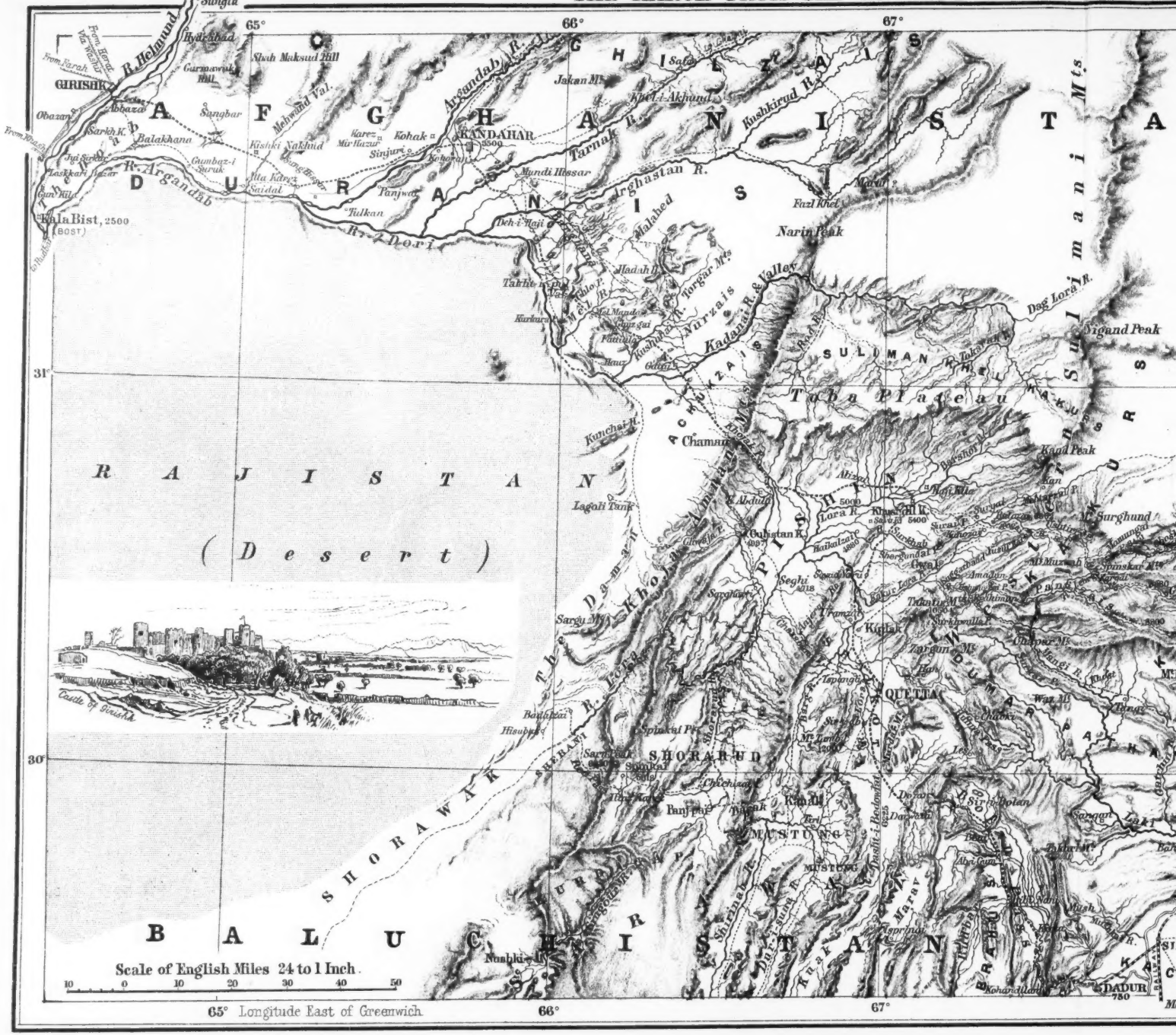
The Shall Valley we note curls round the promontory of Takatu, and at a little beyond Kujlack meets the valley of the Kakur Lora. The vale of the Kakur Lora again opens into the Kanozai-Balozai plateau, which has its origin at the open Kotal of Mehterzai, right under the Kand Peak. By this configuration it arises that there is a fair open way of plains extending along the western face of the Western Sulimani for 70 miles, from the top of the Bolan to the entrance into Zhob.

At Gwal, 30 miles from Quetta, there is a rift in the screen of hills called Suggurband, out of which the Kakur Lora rivulet flows. Through the gap an easy way is found to the low open pass of Ushmugzai, where water drains towards Sibi and back to Pishin. From Sibi to this point I believe a suitable line may be found for the railway from Sukkur to Kandahar now in progress and completed as far as Sibi. The railway should gain the Pishin plateau at Gwal, finding its exit from the hills through the Suggurband defile.

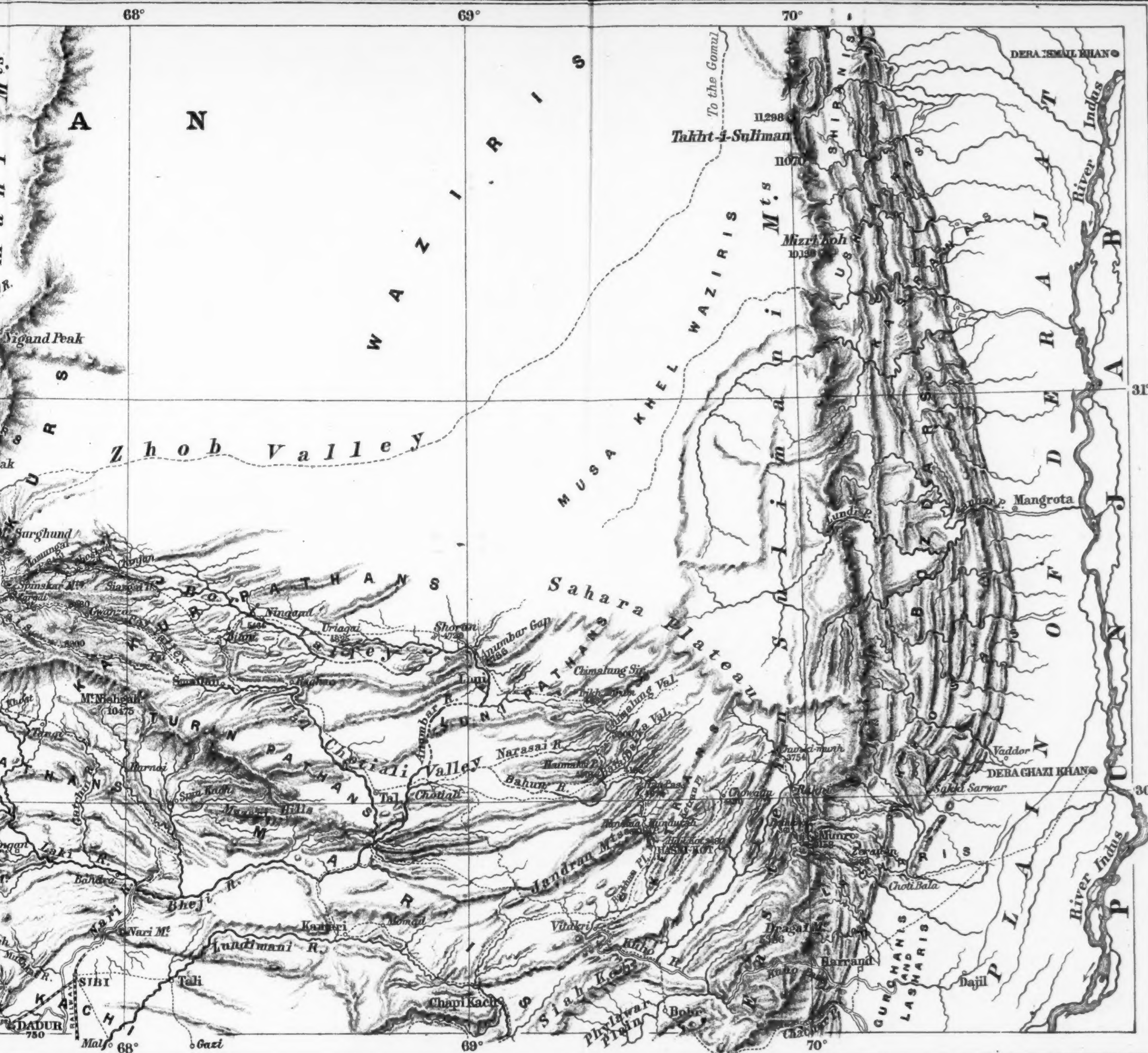
Ten miles north-east of Gwal, and opposite Kanozai, we find an opening in the hills leading due east to the Ushtirra Sirra Pass, elevation 8,277 feet. This point, which is 16 miles in a straight line from Kanozai, lies between the rugged mountains, Surghwund and Muzwah, which are seated on the crest of the ridge. At this place is the water-parting of waters flowing to Pishin by the Togai stream, and to Sibi by the Lehrgut. The route to the pass follows the Togai nulla, which presents no physical difficulties to the construction of a road or railway.

The pass itself lies over an upland of hillocks of clay and other soft formations.

THE MARCH FROM THE HELMUND TO THE INDUS



INDUS BY M. GEN. SIR M.A. BIDDULPH, K.C.B., R.A



Stanford's Geog! Estab! 55 Charing Cross.

Ten miles east of the Ushtirra Sirra a new water-parting is found, called Momungai Isurrai: elevation 8,451 feet.

Here the drainage is to the Lehrgut westwards, and then south to Sibi, and on to the great Bori Valley eastward.

South of the Momungai rises the rocky ridge of Spinskar, which is a prolongation of Muzwah. To the south of Spinskar there is a water-parting (which we did not visit) where waters flow to Sibi by the Lehrgut stream, and westwards by the Pai Valley to Smallan and Tal.

The country between the Ushtirra Sirra and Momungai lying under the rugged mountains around is highly picturesque. The slopes and lower hills are clothed with cypress and other shrubs. Though now uninhabited, we fancied that here the troops and officials might some day find a cool retreat from the bare, sun-heated plains of Khorassan.

From the Momungai Pass the country opens, and at Chinjan, 15 miles down the valley, the wide plains of Bori are spread out. Here and in the neighbourhood we find a few isolated villages and cultivation, and there is a meeting of plains and of roads. Three miles to the east of Chinjan, surrounded by plains, there rises the remarkable natural fortress of Siazgai. This almost inaccessible hill was formerly used by the Moguls as a stronghold, and it seemed to me that it might again serve such a purpose. The eastern boundary of Khorassan is somewhere a little to the east of the Momungai Pass.

For 80 miles in a direction slightly south of east, the Bori Valley offers a fair highway of plains, and its lower end is studded with villages. Here there is much cultivation and a sufficient amount of wood, forage, and grazing, to meet the requirements of troops.

At Shoran, about 60 miles east of Chinjan, we find another meeting of plains and roads. The drainage of western Bori here inclines to the south, and a valley opens stretching a little north of east towards Kirwuddy and a plateau called Sahara. Open gaps in the dividing ridge lead towards Zhob. Sahara is an upland formation, where there is a drainage in all directions, and from the description given by the natives, we believed it to be a connecting link between the West and East Sulimanis.

Near Biani, 24 miles from Chinjan, in a direction south by south-east, there is a pass connecting the Bori Valley with that of Pai and Smallan, which leads on to Tal and Chotiali by successive plains. These here and there are hemmed in by the hills, and do not present the broad open character of the Bori Valley. Eastward of the pass, the ridge dividing Bori from the Smallan-Tal Valley is a more abrupt and continuous feature, and the passes over it are only fit for footmen.

Ten miles east of Shoran, the streams which drain West and East Bori unite, and the combined river escapes through the ridge by the Annumbar gap, and pursues a south-west course towards the Kachi. A few miles south of the gap the country opens out, and here is found the chief town of the Luni Pathans. At about 30 miles from the gap, the Annumbar receives the Pai-Tal-Chotiah stream.

From the Luni country eastward, the character of the country changes. The valleys no longer have a direction east and west. Three ridges run from north-east to south-west, containing the Chimalung

and the Bala-Dakka Valleys, which seem to have their origin in the Sahara plateau. The streams draining these valleys flow towards the Annumbar.

Of these ridges the third, the Jandran Range, is the most formidable feature, but it seemed to us possible to lay out a line of road, or even a railway through this country, which would have no very severe gradient.

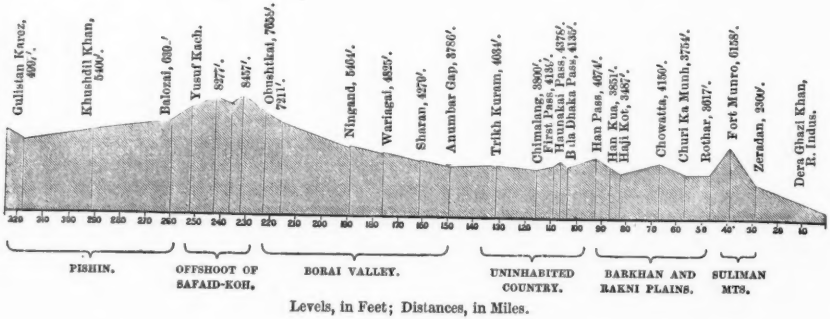
The Hun Pass leads over the Jandran Range, and the road gains the Barkhan Plain by the Hundurah at Hasni Kot. The Barkhan Plain is continuous to the Vatakri Plain, and from here there is a road with an easy gradient down to the Derajat through the Chachar pass.

To the north-east, Barkhan opens on the Kitran Plain, which is connected by open valleys with the Rakni Plain. Rakni is a long strip of inclined vale, running along the west flank of the Eastern Sulimani, extending, it is believed, to the Sahara plateau.

From Rothar, the Rakni village at the foot of the Sulimani, on the west side there is a road up to Fort Munro, the summer settlement of the Dera-Ghazi-Khan officials, from whence a steep path leads down to Zeradan, the first stage in the Derajat.

The section here given will enable the student to understand the gradients of the passes and the position and elevation of the valleys up to the Khoja Amran.

SECTION OF ROUTE FROM THE INDUS TO THE PLAINS OF PISHIN.



Levels, in Feet; Distances, in Miles.

Returning to the Pishin border, we find the Kanozai-Balozai plateau runs up to the north-east, to an open saucer-shaped pass at Mehterzai—elevation 7,139—which leads into the Zhob Valley. This extensive country is described to us as a wide plain not less important than Pishin and longer than Bori. Zhob touches the Gomal, and therefore finds an outlet to the Derajat by the Ghwaleri Pass.

The Balozai Plain drained by the Surkhab is produced in a direction south-west, and joins the Pishin Valley beneath the Shergundai Peak. There is thus a continuous circuit of plains and vales winding

all round the eastern border and into the central Pishin Plain. This feature has a great military and political importance.

The Shergundai Peak is the extremity of a spur of the Kand Mountain, and there is a short cut by the Surai Pass from Balozai to Kushdil Khan Ka Killa over the ridge dividing the Balozai from the Barshor Valleys.

So far the country described—from Kujlak along the east border of Pishin, and down to the Eastern Sulimani, and round to the confines of Zhob, and on to Kushdil Khan Ka Killa—is new ground, which has never before been visited by Europeans.

From the Surai Pass we got a wonderful view over the Pishin plains, which, with views from other heights, enabled us to understand the country early in the course of our operations.

A comprehensive study of the Pishin country shows that it is on its north-western side supported on a limb of the Western Sulimani. This spur, which defines the west of the Barshor Valley, is spread out into the broad plateau of Toba, and is then produced as a continuous ridge dividing Pishin from the plains of Kadani, under the name of Khoja Amran.

The Barshor Valley is a deep bay of the plain, and there is an open valley within the outer screen of hills, which was not visited by us.

A road strikes off here to the Ghilzai country and to Ghazni. Kushdil Khan Ka Killa has been placed in the bay of the plains in a position commanding the roads which concentrate there. An important communication is one from the Kojak along the Daman or mountain skirt by which the deep nullas of the Loras, and other obstructions can be avoided.

Though intersected by some very low and unimportant hills and ridges, and thus separated into compartments, the Pishin plains and those of Shallkot may be looked upon as one feature. We may imagine the Shall Valley being as it were the vestibule, the Kujlak-Kakur Vale the passage, the Sayud Yaru Plain an antechamber, and Pishin proper the great *salle*.

Surrounded by mountains which give forth an abundant supply of water, the lands bordering on the hills are studded with villages, and there is much cultivation, and a capacity for a great deal more prosperity than has hitherto been possible under an insecure Government. There is a total absence of timber, and the cultivation of fruit trees seems to have been neglected.

The Lora rivers cutting deep into the plain offer considerable obstacles to the construction of roads in some directions, but owing to the happy disposition of the plains, it is possible in great part to avoid them.

The Khoja Amran is a ridge of uniform character, having a long slope on its eastern side, and a steep scarp towards the west. It is a complete rampart overlooking Kadani and the plains stretching towards Kandahar, over which, from its summit, there is a most singular view.

The plains, several thousand feet below, are laid out like a sea, and the mountains run out into isolated promontories—to the left the desert is seen having the appearance of a turbulent tide about to over-

flow the tranquil plains at our feet. Far away in the midst of the desert, mountain tops appear already enveloped by the sandy waste.

This great feature, which has such an influence on the country of Khorassan, stretches for a distance of 300 miles in a north-west direction from Shorawak, at the end of the Khoja Amran, to Lash-Jowain in Seistan.

Rajistan, as it is called by the natives, is composed in great part of loose sand, which is in movement under the influence of the prevailing south-west wind. The tilt of the country is from the Hindu Kush towards the desert, and the rivers and streams all have a course north-east to south-west. The sand has, however, from all time been in antagonism to the waters, absorbing the streams or turning them by its embankment out of their natural course. The result is that the rivers, hindered in pursuing their original direction, are diverted to the north and westward, and flow towards the lower country, seeking an outlet. Hence stream is collected to stream, and river to river, and the combined waters flow round the desert edge till they reach the Helmund, which towards the end of its course is also diverted from its proper direction, and eventually lost in the swamps of Seistan.

From the Khoja Amran on to Kandahar the country is disposed as follows:—On the left there is the desert stretching with a line of bluffs at first due north and then trending to the westward. On the right the offshoots of the main ranges enclose a succession of valleys, the promontories being broken into isolated masses with passages between them along the margin of the desert.

The principal valleys are the Kadani, the Mêl, the Takhtipul, the Arghessan, and the Turnak.

The Kadani is a vast plain divided from the Mêl by a group of hills through which there are, opposite the Ghwaja, the Hauz, and in front of the Khojak, the Ghuzgai passes. The Mel communicates with the Takhtipul Valley by the Kirkanai and Ghlo Kotals, and there is the Burghanai leading direct to the Arghessan Valley.

At Takhtipul, the Khojak and the Ghwaja roads unite.

From the Takhtipul Valley to the Arghessan there are wide gaps offering no obstruction. The lower portion of the Arghessan and Turnak Valleys is one wide expanse of plain, and a ridge divides it from the Kandahar plain.

The rivers so far do not present much impediment to the passage of troops in dry weather, but in flood they become most serious obstacles and cannot be passed till the waters retire. Altogether we find the country between the Kadani and the Kandahar plains affords successive positions suitable for defence.

The plain of Kandahar may be entered from that of the Turnak by several gaps, and those on the chief roads are capable of being strongly defended; the watercourses on the right bank of the river would add much to the difficulty of attack from the eastward. Though only a side portion of the Turnak Valley, the Kandahar plain bounded on the east by a ridge, and divided from the Argandab Valley by a mountain range, has all the appearance of a distinct valley. Kandahar stands on the western side of the plain which was originally a barren skirt of

the mountain. Exactly opposite the city, and two miles to the westward, there is a wide break in the dividing range through which the road to Herat leads, and by which are conducted the many canals and watercourses taken from the Argandab to supply the town and fertilize its environs. The energy and skill displayed in these extensive waterworks cannot be too highly extolled. Brought from a point many miles distant in the Argandab Valley, the chief canal with its off-shoots conducts a vast body of water, which is dispersed along the contours of the declining plain in innumerable channels, spreading a rich fertility for many miles in a fan-like form to the south-east of the gap. Villages cluster around the city on three sides. Cornfields, orchards, gardens, and vineyards are seen in luxurious succession, presenting a veritable oasis within the girdle of rugged hills and desert wastes all round. And if we turn to the aspect of the country beyond the gap we see in the Argandab Valley along the canals and the river banks a fair and beautiful landscape of village and cultivated ground, stretching for many miles in each direction. If we could cast our eyes still further, we should see in the vales of the Turnak and Arghessan, districts scarcely less fertile.

This productive character of the immediate neighbourhood of Kandahar, and its commanding position within reach of other fertile districts, would give to this place under a strong, stable, and just Government, as much prosperity and happiness as falls to the lot of any place in the world.

Kandahar having to the south the boundary of an impassable desert, and on the north the terminal spurs of the offshoots of the great range, it follows that the main communications with the outside world lie along the strip of country between the desert and the mountains, westward with Herat and to the south-eastward with India. A third road to the interior of the country leads up the Turnak Valley to Ghazni. Beyond these three roads there are no others fit for the march of armies or for trade communications.

The position of Kandahar near to the slopes of the range to the westward of the city renders it impossible to construct works close at hand, to cover the road from Herat. The high ridge and outlying hills dividing Kandahar and its suburbs from the Argandab Valley completely command all the level ground between the city and the pass. Beyond the gap a group of detached mountains extends overlooking the approaches, and follows the left bank of the Argandab, as far down as Panjwai, 15 miles distant. Positions for defensive works must be sought, therefore, in front of that place, on the right bank of the river.

To the north-east of Kandahar the open plain affords situations for forts well removed from the hills at a short distance from the town, and at Akhund Ziarut, 30 miles on the road to Ghazni, there is a gorge, which would, if held, add to the security on that quarter.

The country between Kandahar and the Helmund has the same general characteristics: there is a strip of plains and skirts of the mountains, bounded on the south by the desert, and on the north by successive spurs of the main range.

The River Dori flows along the meeting of the plain and the desert, and joins the Argandab at a point opposite Atta Karez, about 32 miles distant from Kandahar. The Argandab coasts along the desert, and for some distance inclines to the north, and eventually at Balakhana the river gains a mastery over the desert, and turning south-west, flows in the direction of the tilt of the country to join the Helmund a little below the ancient city of Kala Bist or Bost.

The fall of the whole of the Khorassan plateau to the westward is shown by the following elevations—Pishin 5,000 feet—Kandahar 3,500 feet—and Kala Bist 2,500 feet.

At Sinjuri, about 11 miles west of Kandahar on the right bank of the Argandab, there commences a system of mountain skirts, for the most part sterile, which extend in a great curve round the ends of the promontories of the hills to the left bank of the Helmund. This wide stretch of country is, for certain seasons, a grazing ground; but except where fertilized with karezes, in some good positions, it is unfit for cultivation. To the left of this sterile plain lies the fertile tract along the banks of the Argandab, presenting a strange and charming contrast to the waste around.

The limb which forms the western limit of the Argandab Valley is here seen bounding the great plain on the right hand, and forming an impassable barrier. From Sinjuri there are, however, paths leading into the next valley of Khakrez passable for footmen and lightly-laden camels.

This rugged barrier opposite Atta Karez approaches the desert to within about 10 miles, so that the traversable open plain is reduced to that narrow limit. On the whole road from Herat to Kandahar this is the narrowest gateway, and this remarkable feature, and the concentration of roads here, gives to Atta Karez a strategic importance unequalled by any other spot between India and Central Asia.

The roads which meet at Atta Karez are as follows:—The great Herat highway passes through Kokeran, and crosses the Argandab opposite Sinjuri, from whence it lies along the open plain all the way to Atta Karez; second, the road which crosses the Argandab at Panjwai, and afterwards traverses the many watercourses on the left bank of the river; third, the road from Taktipul towards Herat, which follows the edge of the desert, and leaves Kandahar to the north.

The roads which strike off to the westward towards Herat are:—The one along the skirt of the mountains through Kishki Nakhud direct to Girishk, and a more circuitous one to Bala Khana. From Bala Khana a road branches off to Kala Bist by the Doab, and another strikes over the waste to Abbaza, a village opposite the ford and ferry, to Girishk.

Kishki Nakhud is situated at the foot of the range before mentioned. The abundance of water here supplied by karezes and watercourses creates an oasis in the sterile waste, and the cultivation follows the course of the water down a depression in the plain towards Kala Saidal, there being a line of villages in that direction. Kala Saidal is equidistant from the end of the hill with Atta Karez, and thus the three villages form a triangle, and support one another. The import-

ance which was formerly attached to these points is attested by the remains of forts, some of which are of extreme antiquity. At Sung Hissar there are the ruins of a very important work on an isolated hill.

I have examined the ground in front of Atta Karez, and discovered a site for a work which would command the valley of the Argandab, and sweep the elevated open plain towards the west and north-west, and Sung Hissar might again be used as a fortified post of support.

To the westward of this trilateral the open country expands in a triangular form, of which the north side is bounded by the line of hills, the south by the Argandab and the desert, and the base by the Helmund. In a direct line to Abbaza from Atta Karez the distance is about 46 miles, and the open country along the left bank of the Helmund from the mountains down to the junction of this river with the Argandab is about 75 miles in extent.

The whole of this tract of country is an undulating and at the same time inclined plain sloping from the hills.

Opposite Girishk, the plateau is elevated 175 feet above the river, while, at the same time, it gradually slopes away towards Bost in gentle undulations.

Throughout the whole distance, from some miles above Abbaza, down to the ancient city, the left bank maintains a decided command over the river and the alluvial tract on its right bank, and affords positions for defence and observation of its passages.

To the westward beyond the Helmund a vast expanse of sterile and slightly undulating plain extends, bounded on the north by the hills, and without limits to the south and west.

A road *viâ* Washir strikes off from Girishk partly through the hills towards Herat, which is said to be the best supplied with water and is cooler, and passes through a more cultivated country than the road to the south of it. This latter road, leading west by north, is directed on Farrah; it has less physical difficulties, but is not so well supplied with water, fodder, or cultivation. It is, however, quite passable with proper precautions and arrangements.

To the north, roads lead to Zamindawar, and terminate in the mountains.

In the great arc from west by north to the course of the Helmund no intermediate passable track exists. The road by Bost, Rudbar, and Lash, along the course of the river, passes through tracts more or less cultivated, and productive of fodder and grazing. This road has been frequently used by armies in their march to and from Kandahar. Besides the three roads above mentioned there are no others between the Helmund and Herat.

The River Helmund being about 4 feet deep at the fords, and from 90 to 120 yards wide, and having several separate channels, presents a considerable obstacle to the passage of an army; the river is subject to floods, when it would be quite impassable without a bridge. It follows, therefore, that any army intending to pass the Helmund must be provided with bridge material. Although the fords in the dry season are numerous, the principal passage for the two northern

roads is at Girishk. The castle of that name stands at a point where the road leaves the valley to gain the plain described as stretching to the westward.

The position at Abbaza, which is very strong, is best illustrated by a plan and sketches. The configuration of the country from the hills down the course of the Helmund is that of a seam of verdure and cultivation set within two boundaries of sterile plains. There are no mountains, as indicated in the maps, in the neighbourhood of Girishk.

This alluvial tract is diversified with woods, grass lands, and cultivation. Villages are grouped in the wider positions of the valley, and there is an elaborate system of irrigation canals. In all Khorassan there is not a more productive country, and nowhere is there so much grass and wood to be found. In the great bend of the Helmund, where it coasts along the desert, the valley is equally productive. The cultivated lands lie alternately on either bank. Sterile wastes and sandy deserts bound the streak of verdure on both sides.

In the Argandab and Helmund Doab a considerable amount of cultivation exists on the right bank and in the angle above the junction of the rivers; the waters of both the Helmund and the Argandab are led, for the irrigation of the low-lying sands, through extensive channels.

At the extremity of the angular plateau, on the right of the Doab and on the left bank of the Helmund, stands the remains of the ancient city of Bost. At the very south extremity of the high bank the citadel commands the ford over the Helmund.

The ruins of the city are in a wonderful state of preservation, palaces with extensive courtyards are found along the margin of the river, to which stairs descended from the several residences.

The citadel itself seems to have been built on the *débris* of very ancient fortifications and buildings, and rises to a height of some 150 feet above the bed of the river. The base of the fortifications is washed by a channel only, the main body of the river flows some little distance off. The outer fortifications consist of a rampart and ditch traced in the form of a rectangle, the citadel being placed at the south end, and cut off by an internal ditch and rampart.

The position of Bost is a most important one, as it commands the entrance from the Gurmsir and valley of the Helmund into the Doab on the road to Kandahar.

The junction of the two rivers takes place about 3 miles below the citadel, and we find on the desert cliff at that point the remains of a watch tower.

It is to be noted that at Kishki Nakhud, Kila Saidal, all along the course of the Helmund, and here at Bost, remains of fortifications and buildings seem to attest the high estimation in which all these strategic points were held. Throughout all this part of Khorassan ruins mark every point of interest; whether this importance was due to the fertility of the neighbouring lands or to the spot being of military importance.[1]

[1] A note by Colonel Yule, in the Appendix, gives all that is known of the ancient city of Bost, which seems to have been visited by few travellers.

Part 2.

Baluchistan—Kelat State—Events which led to British Occupation of Quetta—Tribes.

The country of Baluchistan may be said to be inhabited by Baluchis, but when we come to examine the several tribes which people this wide and irregular country, we find that though claiming the distinctive appellation of "Baluch," the tribes do not own a common cradle, and have not the characteristics of one family. The origin, character, and customs, however, of the Baluchis distinguish them in a marked way from their neighbours the Afghans.

In Baluchistan there are said to be three great classes, the Brahuis, the Lumris, and the Rhinds. Of these the Brahuis, inhabiting the plateau of Kelat and the neighbourhood, and the Rhinds of the eastern border of Baluchistan, are those with whom we have had most to do in the recent operations.

The Brahuis give Khans to Kelat; they are a migratory race, warlike, entirely engaged in raiding, as all Baluchi tribes are. The Rhinds are composed of a number of tribes, having Tumundars, or chiefs, who are hereditary. Some of these tribes, such as the Ketrans[1] and Bozdars, occupying the north-east corner of the country, are independent. The Maris and Bugtis inhabiting the hills along the projecting promontory of the Suliman, are quasi-independent, paying no tribute to the Khan of Kelat, but acknowledging him as head of the Baluch confederacy.

A few of those Tumundars who have their tribes partly in British territory, and partly in the Baluch country, are our subjects. The tribes so situated are the Mazaris, the Gurchanis, the Legaris, Lunds, and Kosahs. Of all the Rhind tribes, the Maris are the most powerful. As the authority of the Khan of Kelat became weak, the Maris exhibited their independence, made war on the Khan, or committed raids in defiance of his authority, and in 1874 Guzzun Khan, the Mari Tumundar, was openly termed "the Nawab of the Hills." The Bugtis, whose country lies to the south of that of the Maris, is the next most independent tribe. Less powerful than the Maris, they have, however, been their rivals, and often successfully held their own in their internal periodical wars.

The country inhabited by the Maris and Bugtis, and some other tribes, does not favour the pursuits of cultivation or of a settled life, on the contrary, the want of lands suitable for agriculture obliges the Baluch to raid, and in such a life he glories. To be prominent and successful in the "Chappao" is the Baluchi's whole aim. As a rule they are mounted, and invariably ride mares having great powers of endurance. The Baluch is no fanatic. He leaves the duty of prayer and sacred observances to his Tumundar, who undertakes the office, without becoming in any way over-righteous, but as a part of the

[1] The Ketrans are said to be a Pathan tribe. They have all the manners and dress of Baluchis.

duty of his position. He is gay and fond of sport, and has principles of honour in a marked degree.

The early history of Baluchistan is enveloped in mystery, and is of a very fragmentary character. We know that for many centuries Kelat was governed by a Hindoo dynasty, and the last Rajah was named Sewah, or this was the hereditary title. Previous to the Hindoo Raj, a Mahomedan family was in power. The Sewah having, towards the end of the 17th century, been obliged to invite aid to repress the encroachments of a Rhind tribe, Kambar, a chief of a sub-tribe of the Brahuis, came to his assistance, and eventually assuming the chief power, Kambar reigned at Kelat.

On the accession of Kambar to power, the tribes having decided that his rule should be hereditary, a constitution, suited to the tribal nature of the people, was formed. The country was divided into two provinces, Sarawan and Jhallawan, in which two sirdars were placed in chief authority over minor chiefs and their tribes. Hereditary succession for these sirdarships was made the principle.

It was ordained that they should sit on the right and left of the Khan in durbar, as counsellors. Besides these functionaries, the Khan was assisted by a special adviser, or Wazir, also hereditary, who was selected from the Tagik population; by this means the class from which the revenue was principally obtained was conciliated.

In these days the resources of the Khan were scanty, and the state was altogether insignificant. In 1839 the invasion of India by Nadir Shah afforded to Mohbut Khan, the ruler of Kelat, the opportunity of rendering great services to the Persian monarch, and in recognition of these, the province of Kach-Gandava was ceded to him. In the reign of Ahmad Shah, Nadir's successor, in consequence of the tyrannical conduct of Mohbut, Nasir, his brother, having expostulated with him without effect, is said to have assassinated him, and, with the consent of the Shah, Nasir Khan assumed the reins of government. Aiming at the consolidation of the confederacy, Nasir divided the lands and revenue of Kach-Gandava into four equal portions, assigning two shares to the tribes of Sarawan and Jhallawan, and the other two, one to the Jat population of the country, and the other to benefit his own revenue. A part occupied by the Rhinds and Maghzis was not interfered with, as these tribes had received special grants, which placed them on a more independent footing in the time of Nadir Shah. At the same time it appears that the Rhinds entered into the political system of the Brahuis, by being attached to Sarawan.

The measures thus taken established a sagacious political economy, which was popular with the tribal chiefs, and enlisted them in the cause of maintaining the integrity of the confederation and the supremacy of the Khan over newly acquired districts.

Aided by the contingents of the chiefs, Nasir Khan I added to his dominions by conquest, and Ahmad Shah made over to him the Shall and Mustung Valleys. Although the Khan's relationship with his suzerain was not unruffled, he was able to render conspicuous services afterwards, and as a reward the Shah granted him the Harrand and Dajil districts on the Derajat, to hold in perpetuity.

Nasir Khan reigned 40 years, and died in 1795. Combining all the high qualities of an able administrator, and enlisting the hearty co-operation of his feudal chiefs, he left the Khanate of Baluchistan, extending from the Arabian Sea to the Indus at Dera-Ghazi-Khan, and a name which is still proverbial amongst all classes of the population for equity, liberality, and wisdom.

No succeeding ruler of Kelat has ever equalled Nasir I in power of administration, or in the wide sway exercised by him. Gradually, through the weakness of character of the Khans, through intrigue, and the rebellion of distant districts, the curtailment of territory was brought about, and the power of the Khans over the tribes has been loosened.

Passing over intermediate history we find that in 1830 Harrand and Dajil were sequestered from Baluch territory, and annexed by Runjit Sing to the Punjab.

In 1838, the Indian Government having resolved to restore Shah Sujah to the Afghan throne, intercourse between the British and the Khan of Kelat took place early in that year as a preparatory measure to the passage of the troops through his dominions.

The march of the columns through the Kachi and the Bolan to Quetta was attended with constant harassing by the warlike tribes on all sides of the routes and passes. The most daring raids and attacks were made on detached parties and on the baggage trains, causing loss of life and general obstruction. Mehrab Khan, the ruler of Kelat, who was badly advised by an intriguing minister, Mulla Mahomed Hussain, had little control over the Bolan, or failed to exercise it; the authorities had, however, the belief that he was the instigator of the lawless attacks upon our communications by his own subjects. Mehrab Khan was accused also of the design of starving out the army, by withholding stores of grain and interfering with the natural supply of the country to Quetta.

So straitened were the troops that they were placed on half rations, and the cavalry suffered severely, and at one time it was a question whether the army had not better give up the expedition and retire. In addition to these hostile acts the Khan, through arrogance or suspicion, declined the invitation to pay his respects to the Shah as required by etiquette. In all these failings the Khan was found to be treacherous and hostile to the British Government, and it was determined, in order to establish security in this quarter, to exact retribution.

In November, 1839, a force under the command of General Willshire was sent to depose the Khan, and the British force gallantly took Kelat, which was defended with much obstinacy. Mehrab died sword in hand, surrounded by his chiefs, many of whom perished with him.

In their first attempts at restoring the Khanship, the British authorities were far from fortunate. By selecting the son of Mohbut and ignoring the claims of Mir Nasir, the son of Mehrab, an error was committed, and the transfer of Mustung and Shall to Shah Sujah helped to create rebellion, which shortly broke out into open warfare. Certain disaffected sirdars supported the cause of Mir Nasir; Kelat was

attacked, and treachery within the walls aided the rebels, and the supreme Baluch authorities, the sirdars of Sarawan and Jhallawan, elected Mir Nasir to be the new Khan. In the end Mir Nasir tendered his submission to the British authority. The Government installed him formally, and a Treaty was concluded dated October the 6th, 1841.

A short time after this settlement, the reverses of the British in Afghanistan obliged the Government to again make a military movement by the Bolan and Quetta into Afghanistan, and Mir Nasir II kept his engagements and assisted in the operations to the best of his ability. In 1843, the province of Sind was conquered and annexed. This acquisition brought our possessions into contact with those of the Khan. At the close of the war, the troops having been removed, the tribes found an opportunity to follow their habitual inclinations, and raids and inroads took place. Mulla Mahomed Hussain, the evil adviser of Mehrab and chief cause of his downfall, was in favour at Kelat, and was engaged in his old game of evil advice and intrigue.

In 1847, a new administration was created on the Sind frontier, with the view of repressing the aggressive acts of the Baluch tribes, and introducing order along our border. To this new organization, Major Jacob, a very talented and energetic soldier, was appointed with the title of "Political Superintendent and Commander of the "Upper Sind Frontier." Major Jacob took up his quarters at Khanpur, at that time a miserable village on the edge of the desert, 50 miles from Sukkur. For a number of years this Officer pursued a line of vigorous action, punishing the raids of the tribes by attack in the plain with his cavalry detachments, which were posted along the border and ever on the alert. General Jacob originated measures which resulted under a succession of able Officers in introducing peace, order, and respect for the British name where hitherto there had been rapine, murder, and a state of constant alarm.

Soon after Jacob took up office, Mahomed Hussain visited him and impressed him favourably. At a second visit this wily intriguer proposed that he himself should seize the chief power at Kelat and succeed to the Khanship. The exposure of this plot, which Mir Nasir could scarcely credit, and the consequent destruction of the influence of the traitorous minister, brought about a good understanding between the British Government and the Khan, and led to the contract of a second Treaty, which was effected in May, 1854. The provisions of this Treaty were that Mir Nasir II bound himself to oppose the enemies of the British, to act subordinate to the Government, and to enter into no negotiations with other States without consent.

If it should be necessary to station troops in the country of Kelat they should occupy the positions considered advisable.

The Khan should prevent plundering and outrage within or near British territory, and protect merchants, making no exactions beyond the levy of an equitable duty to be fixed by Government.

On the faithful performance of these several engagements the Khan was to receive an annual subsidy of Rs. 50,000, which grant was to be withheld if the conditions were not acted up to.

This Treaty, ratified in the presence of and with the consent of the chiefs of the confederation, remained unfulfilled. The Khan neglected to enforce order, and the Government took no decisive action to oblige him to do so, and the application of the subsidy to the Khan's own purposes, and to the support of a mercenary force, was regarded as a menace by the chiefs, and occasioned a pecuniary loss, while at the same time they were thwarted in making their own terms with the caravans.

As regards the stipulation for the prevention of plundering caravans, this remained a dead letter, and the Bolan was closed and all traffic at an end.

In 1857, Mir Nasir died suddenly, and it is said he was poisoned by Gul Mahomed, an Officer of his court, who hated the English, and hoped to find a more pliable character in the Khan's younger brother, Khuddadad, the next heir.

The death of Nasir II, at the early age of 31, proved to be a calamity. In spite of his failings, no prince, since the days of Nasir the Great, had exhibited so much judgment and capacity to govern, and latterly he had shown a disposition to be guided by the counsels of the British authorities.

Mir Khuddadad Khan succeeded to the Khanate without obstruction, but there were opposing factions at work, who by intrigue and at length by open rebellion, tried to gain their own selfish ends. Khuddadad was but a youth, and being surrounded by an intriguing court and evil-disposed sirdars, opportunity was afforded to the chiefs of making insolent and inordinate demands.

We have seen how in 1847 an administration was originated on the Sind frontier, to conduct our relations with Baluchistan in view to replacing chronic disorder by peace and a gradual spread of security. With the conquest of the Punjab the British Government assumed on that frontier the position which hitherto had been held by Runjit Sing as paramount Sovereign. The Punjab touched Baluch territory for a length of 200 miles.

It hence followed that it came to be the business of the Lieutenant-Governors of the Punjab, assisted by Derajat Officers, to carry on our relations with the semi-independent tribes—the Maris, Bugtis, and others—who at times contumaciously assumed independence, but nevertheless were integral parts of the Baluch Confederacy.

The reign of Khuddadad Khan, the present ruler of the Khanate, has been marked by anarchy and civil war with scarce any intermission, culminating in a state of affairs which in 1874—1875 became intolerable. As it has been shown, the connection between the tribes within and without the border is very intimate. Hence disturbance within gave rise to vibrations felt throughout our whole border. Trade routes were closed, the Treaty stipulations were set at nought, and the Khan himself was in danger of losing his throne and even his life. In fine, the country was open to foreign intrigue and aggression.

To avert an impending crisis Major Sandeman, who had obtained an influence over the tribes, was deputed to the Mari and Brahui Chiefs, and was well received by them, and subsequently by the Khan himself.

Both the parties of the conflict were weary and exhausted by the struggle. The British Officer was welcomed by Khan and sirdars alike. In spite of a spirit of lawless insubordination, there was a principle of loyalty to the Khan, and above all, on both sides, the instinct of subordination to the paramount power was inherent. These principles have been the mainstay of our political success on this frontier.

Although this mission was not completely successful, it was productive of a new order of things and opened the door to more satisfactory mediations which formed the next step in the history of Kelat.

It was now determined that Major Sandeman should again (1876) visit the Court of the Khan, invested with higher powers and an authority supported by a military force.

At the time when the Envoy and escort entered Kelat a number of caravans were expecting the re-opening of the great trade route, and advantage was taken to let them pass through the dangerous region under protection of the British force.

Although the Chiefs generally gave their allegiance, the breach between them and the Khan was so wide that many declared that peace would not be assured unless the Khan was deposed and a new ruler was installed protected by our troops, and some were advocates of the British Government assuming the sovereignty over Kelat for good.

However, by the tact and judgment of the Envoy, decisions between the rival parties were arrived at. The Khan and the sirdars met each other half way in a fairly amicable spirit, and terms of reconciliation were drawn up and read out in durbar.

The agreement made was in these terms:—"We do heartily agree "to aid, to the best of our power, in keeping open the trade routes, to "preserve the peace of the country, and we swear we will do nothing "to violate this our written agreement of peace."

During the sojourn of the mission in the country Kelat enjoyed a repose and a commercial and agricultural prosperity such as never had been before known. Trade was resumed, villages were rebuilt, and land that was lying fallow was brought under cultivation.

The succeeding step in the proceedings was the execution of a Treaty, based on the stipulations of former engagements, amplified to complete relations between the two Governments in a manner calculated to promote the interests of both; and as the troops of the British Government were already at Kelat, where their presence was heartily welcomed, it was wisely decided not to withdraw them.

The final arrangement was the constitution of an agency over which Major Sandeman should preside and the location of the troops and Agent at Quetta. It was rightly judged that to influence the Khan and the tribes we must be in contact with them. Thus a most important part of our frontier has been converted from a scene of disorder into a fairly peaceable country, and a base of operations was afforded which saved infinite hardship and even loss and bloodshed in the operations which became necessary in 1878.

Part 3.

The March to the Helmund.

As in this lecture it will be impossible to give details of the whole march, the plan pursued will be, to represent events up to certain marked points in a cursory manner, and to take a view of some of the leading situations, commencing with Mooltan, the point of departure.

Mooltan.

Towards the end of September, 1878, the intercourse between the British Government and the Amir of Cabul became so strained that the probability of an early recourse to arms was foreseen, and a concentration of troops was made towards three points on the frontier, viz., to Peshawur, the Kurrum, and to Quetta. It fell to my lot to command the Quetta column.

The several scenes of operations were so distinct that no intercommunication could take place, and thus the several commanders were entirely independent of each other, and received instructions direct from the headquarters of the Army and of Government.

On the 8th October I reached Mooltan, and found orders to "take "command of the troops now at Quetta, and under orders to that "place."

The force thus placed under my command proved to be 3 regiments of cavalry, 7 of infantry, 1 field and 2 mountain batteries, 2 companies of sappers and miners, a field engineer and ordnance parks. About 6,400 men, and 16 guns.

It was about the 23rd of September when the corps began to move from Mooltan. The departure of troops from Jacobabad was delayed by the unusually extensive floods of the Indus.

The route taken from Mooltan was across two rivers, the Chenab and the Indus, to Dera-Ghazi-Khan, 46 miles; and although every facility was afforded by using steamers and flats in transporting the troops, crossing the rivers exposed the men and Officers to a sun which had not yet lost much of its violent heat. Long weary marches over tracts of desert and sterile hot low hills had to be traversed to reach the foot of the Bolan Pass.

The orders for the march were carried into effect by the local military authorities. The operation was a simple route march; but from the want of proper preparation at the important strategic point, Mooltan, the movement was not made without considerable strain in all the departments, particularly those of supply.

The principal features of the instructions were, the scale of camp equipage and baggage was set at the lowest possible allowance, which was considered consistent with health and comfort, a month's provisions were to be sent with each corps, and commanders were warned that moving through the territory of a friendly chief—that of the Khan of Kelat—the people were to be treated with considera-

tion; at the same time all proper precautions were to be taken to guard against marauders.

At Mooltan I was joined by the following Officers of my Staff:—Major G. B. Wolseley, Assistant Adjutant-General; Captain H. B. Hanna, Deputy Assistant Quartermaster-General; Captain W. S. S. Bisset, R.E., Field Engineer; Captain W. G. Nicholson, R.E., Field Engineer.

During a delay of a few days at Mooltan, opportunity was taken to make demands for such articles and stores of which we were deficient. Captain Nicholson was instructed to remain behind and form a field mule train of tools and implements for blasting, and he was to bring with him ropes and cordage.

Our communications with distant departments were made by telegraph, but serious inconvenience was felt by the arsenal at Ferozepore being unconnected with the Lahore and Mooltan Railway.

Leaving much of the duty of collecting our requirements to General Murray, commanding at Mooltan, we set out on our way on the 13th by taking the steamer specially placed at our disposal, which was laden with commissariat stores, and with its attendant flats, gave ample accommodation to a detachment of troops and several Officers, with horses and followers.

On the third day we reached Mithunkot, on the right bank of the Indus, and we found this place to have a special importance, for the following reasons:—

The right bank of the Indus is here firm and sufficiently elevated above the level of surrounding lowlands subject to inundation, and there is opposite to Mithunkot a situation suitable for embarkation. Boats, steamers, and flats were collected, and it was intended either to construct a bridge or to transport troops and convoys across the Indus by ferry. And further, the country between Khanpur and the river admitted of the laying out a country road to bring the Mithunkot ferry into connection with the Indus Valley Railway.

Rajanpur, an important frontier station, headquarters of a regiment of cavalry and of infantry, is distant 12 miles. It is the most southerly link of the Derajat chain of military posts, and 72 miles from Dera-Ghazi-Khan, the headquarters of the district. From Rajanpur routes branch off in many directions. Of these the most interesting to us were one direct to the Bolan *viâ* Dera Bugti, and another leading to Vatakri and the Barkhan Plains *viâ* the Chachar Pass.

At Rajanpur, we met the 70th Foot, and E-4 field battery, halting to complete their provision columns. It will give some idea of the climate to notice here, that to shelter the men from the sun the 70th was encamped along the shady avenues and station roads, which were refreshingly cool and green in contrast to the *pāt* all around. This was the last time the troops enjoyed the luxury of shade, and a short period of repose here was much needed by the men.

Arrangements having been completed, the battery and regiment pursued their march, and I joined them on the 22nd at Bandowali, 40 miles distant. The instructions I had received placed me in communication with the agent of the Governor-General at Quetta,—Major

—now Sir Robert—Sandeman,—who was directed to co-operate with me. At Rajanpur I met the local civil authorities of the district, whose assistance to the troops, to myself, and the Staff was invaluable. At my desire it was arranged that I should be accompanied on the march through the Dera Bugti country by Mr. F. Fryer, the Deputy Commissioner of the district, and we were joined by the following Baluch Chiefs on the way:—Nawab Imam Buksh Khan Mazari; Nawab Jemal Khan Legari; Sirdar Miran Khan Drishak. These Chiefs, particularly the two first named, have exerted a highly beneficial influence over our border and Kelat policy. Connected by ties of family relationship and the possession of lands on both sides of the border, and fully possessed with the sense of our justice of purpose and desire for peaceable relations, they have thrown all the power of their influence to assist us; and this they have done with a steadiness of purpose and an ability which merits the highest consideration and praise.

Bandowali is a small fort, containing stabling, native lines, an Officer's quarter, and a well. It is possessed of sufficient defensive capabilities to withstand tribal attacks. Near, on the banks of the Indus, lies Rojan, the chief town of Imam Buksh Khan, and of the Mazari tribe. All round the fort, and to the westward in particular, the country is sandy desert.

The march of E-4 R.A. from Lalgoshi, 16 miles, the latter part of it over deep sand, had, although commenced in the night, caused such distress to bullocks and horses, and consequently to the men, that a halt was made to prepare for a more formidable march of 23 miles to the next camp, Kabrudani, to which place the road lies for the most part over sand. There is no water on the way.

The 70th Regiment, having experienced all the depressing influences of a hot season at Mooltan, which had enforced a constant confinement to barracks, and being suddenly set on the march at a season and in a country subject to great sun heat, suffered considerably from exposure caused by tedious escort and rear-guard duties. There were already 100 men unfit to march, for whom carriage had to be found. The situation of these corps, with so many marches of hot rough country before them, was critical, and special arrangements had to be originated to ensure their comfort and safety.

The preparations on the 23rd, in view to a night march on the 24th, were as follows:—Four wagons of E-4, of those drawn by bullocks, were emptied of their ammunition and placed for security in the fort, and the ammunition was packed suitably for camel transport. Camels were taken from a convoy to supply extra carriage for men unable to march, for whom the hospital establishments were insufficient. Camels were also taken for the ammunition of the four wagons.

Both corps were relieved of their provision columns and all extra baggage, and a convoy was formed, and marched on the evening of the 23rd, under arrangements made by Mr. Fryer, through the Mazari Chief Imam Buksh, who undertook to guard it with his own sowars. The tents could not be struck until the evening of the 24th, on account of the heat of the sun.

The march commenced at 8 P.M., the battery and its escort of 200 picked men of the 70th leading the way. It was a dark night, and we were ill provided with lanterns, which were much required. The surface of the country was soft loose sand intermixed with hummocks. We had hardly proceeded a mile when the forge came to a standstill. A halt of the whole column had to be called, and assistance was rendered to extricate the carriage. From 8 to 10 P.M. the wagons drawn by bullocks were constantly unable to move, and halts had to be made, and it was then evident that it would be a very difficult matter to carry out the march. I then decided to spare the 70th Regiment the exposure and fatigue of attending on the battery, and it was allowed to pursue its march. The battery, assisted by the escort, had to fight its way against unusual difficulties, and I and my Staff, with the Baluch Chief, remained to give such aid and counsel as might be appropriate.

From about 10 to 12 midnight the march proceeded with constant halts, on account of the carriages sticking in the deep sand. After a while a nulla was reached, and its surface appearing smooth, it was hoped that the traction would be lighter. The aspect, however, was deceptive; the wheels cut through the thin crust, and sank into the loose sand beneath, and the draught continued heavy throughout the night.

The progress was a successive movement; wagon after wagon stuck and was left behind. Halts were frequent, and gun and wagon teams had to be sent to bring up the rear carriages. Unhooking and hooking in went on throughout the night, and generally, to get the carriages along, a gallop had to be made for short distances at a time.

This kind of operation continued till about 3 A.M. of the 25th, and it was then calculated that there were yet 16 miles to make to reach the next camp at Kabrudani.

I now consulted with the Officer commanding the battery, Captain Beaver, and with Imam Buksh Khan, and to save men and horses from the burning sun and thirst of the coming day, a depôt of four wagons was made. By this reduction of the number of carriages, we hoped that our progress would be less impeded. They were parked and placed in charge of a few infantry, gunners, and Baluch Guides. A small supply of water was left and the march pursued.

Daylight came on, but the progress continued slow. Frequent halts were necessary, and bringing up carriages occupied us unceasingly.

It was clear that a further abandonment of carriages must be made, and the sun having risen, it was decided to proceed with the six guns only, and the men, horses, and cattle.

Teams of six pairs were therefore hooked to the guns, and the march was now continued without intermission for the remaining 14 miles. Water and food were sent back to the men left behind, and the carriages were extricated during the next day.

This march of 23 miles over desert sand, the most serious difficulty expected to be met with on the road to Quetta, having been overcome, the 70th Regiment preceded the battery, and the headquarter party drew ahead of the regiment.

The matters which now occupied my attention were the improvement of the road by a detachment of sappers under Lieutenant Sharpe, R.E., During the remainder of the march the Officer commanding the battery was required to associate himself with Lieutenant Sharpe, and to inspect the road, in order to direct the workmen to improve those parts which required it.

In other respects, on the whole march from the Indus to Quetta, the most conspicuous feature was the peaceable attitude of the tribes, and the loyal friendly co-operation of the Chiefs. This happy consummation has been brought about by the dexterous management of frontier Officers, and particularly by the tact and energy displayed by Major Sandeman and Mr. Fryer.

A peaceable movement was being made directly through the countries of the Bugtis and Maris, who had in former times been the scourge of the whole border, and who could now have inflicted incalculable injury.

On entering the Bugti territory, I was met by Kechi Khan, Chief of the Shambanis, a section of the Bugtis, and by Shabaz Khan, acting for his father as head of the whole tribe. At Sangsilla, the gateway towards Kahun, the chief town of the Maris, Mehr-Ulla Khan, Tumundar of the tribe, with his retinue and 80 horsemen received me, and proffered duty and aid to Her Majesty in respect to the movement of troops now going on by the border of his country. A durbar was held, in which I was assisted by Mr. Fryer; presents were given, and acknowledgments made to the assembled Chiefs on their friendly attitude.

The physical nature of the Dera Bugti hills presented considerable obstacles to the construction of a good road. We found the country deficient of water and forage, and liable in the hot weather to the fiercest heat. My attention was therefore turned to the cooler tract of country along the higher hills, through which it was known a road existed leading direct from Rajanpur to Pishin *viâ* Vatakri and Tal-Chotiali. It was during this march I made the resolve to examine the western end of this route as soon as I should be in a position to do so.

Quetta, 9th November.

It is time that we should now pass to the scene at Quetta. By the 9th November we had reached Quetta, and we found the native infantry corps sent to reinforce the Quetta garrison encamped around the little station in the midst of which stood the mud fort or Miri. The ground to the north of the settlement rises, and affords good sites for defensive camps.

The arrival of additional troops brought a sense of relief to the officials at Quetta. It was a critical time, and there had been signs which foreboded ill to the small garrison. Colonel J. Browne, R.E., had been busy with the fortification of the fort, and Major Sandeman and his assistant, Mr. Bruce, aided by the Brahui Chiefs and the

Khan's sirdars, had been energetic in the work of pouring in supplies of all kinds.

The great important consideration on which we must congratulate ourselves was that our relations with the Khan of Kelat were firmly established, an Agent resided at the Khan's headquarters, supported by a few troops, and there was telegraph communication to that place from Quetta.

The police duties of the Bolan Pass, the carrying of our post and the care of the line of telegraphs, were all being arranged for, and in every respect, our position on the plateau was very different now to what it had been in the former expeditions, when the Khan and the people were wavering or hostile, and when the want of food put our troops to the greatest straits and sacrifices.

By my direction, in concert with the Agent, the cavalry were located at Mustung for the sake of drawing on other sources of supply, and a more abundant produce of forage.

The measures which first engaged attention were to increase the scale of weights of clothing for native followers, and indeed for all ranks. So far as it was possible in this remote place, bedding and clothing were added where required, and posteens and warm jackets were purchased for the troops. The cold was intense at night, though the days were sunny and pleasant. Ill-clad natives, and those who had suffered from Quetta fever stood the severity of the weather badly, and caused me much anxiety.

On examining the several regimental hospitals, it was discovered that there was much to do to arrange accommodation for the sick; this was carried into effect by completing in a rough manner unfinished native lines and barracks.

The unfinished state of the station, want of roads, the encumberment of the fort with empty houses and *débris*, and the want of sanatory arrangements imposed tasks of severe labour on Officers and troops and on the Staff. In the midst of all such work, preparations for a move had to be made, before the organization of the division could be completed.

So far the Brigade Staff, and commanders of Artillery and Engineers had not joined, and only three Officers of the Divisional Staff were present. There was no commissariat, and the undisciplined thousands of camels and their drivers unclothed and untrained represented ill our transport service. On the 13th I received intimation that I was to be ready to make an advance into Afghanistan, and on the 18th the following Officers arrived and made a welcome addition to our incomplete numbers:—Captain R. M. Stewart, R.A., Assistant Quartermaster-General; Colonel H. Moore, Assistant Quartermaster-General; Lieutenant-Colonel C. B. Le Mesurier, Commanding Royal Artillery; Lieutenant-Colonel W. Hichens, Commanding Royal Engineers; Deputy Surgeon-General T. Hendley, P.M.O.; Surgeon-Major W. G. Manley, V.C.

On the 18th and 19th I made in company with Major Sandeman a personal reconnaissance to Kujlak and the Afghan frontier and returned to Quetta. This examination afforded me, from suitable

heights on the Anjeram range and on the skirt of Takatū, a view over the country of Pishin and intermediate plains.

A depôt of provisions and wood was commenced at Kujlak. The 32nd Pioneers commenced to march, road-making as they moved, and these operations were covered by the formation of an advanced guard at that place.

Previous to carrying out the desired movement a garrison was told off for Quetta, consisting of the 30th Bombay Native Infantry, two mountain guns, and a squadron of native cavalry. Colonel W. G. Mainwaring was appointed commandant.

The march of the force was carried out for convenience of organization and supply by successive detachments, and concentration was made afterwards at suitable points. As it was very desirable that seeking for supplies should be conducted without pressure and without causing irritation to the people, reconnaissances were made attended by experienced Officers who could speak the language, inviting the sale and concentration of such produce as we were in need of. To meet the wants of the troops in the first advance, seven days' food and two days' firewood were carried. As we published our intentions of cash payment, no want of all ordinary produce and no reluctance in parting with it was experienced.

The first position taken up was at Urumzai, where I arrived with my Head-quarters on the 22nd. From that date to the 25th, effect was given to the arrangements for the search for supplies, by sending forward reconnaissances as far as Haiklezai, and in preparing the roads for the artillery and camels. During this period, time was given for the cavalry to come up from Mustung, and for the march of a column of observation to the north-east of Kujlak, consisting of two half battalions, two guns, and two squadrons, which was placed under the command of Colonel Clay, commanding 19th Bengal Native Infantry. This column was in a position to watch our communications, covering Kujlak, and was ready to commence a reconnaissance I had in view along the eastern border of Pishin.

On the 25th the main body of the force marched to the fine open plain of Sayad Yaru Karez, reconnaissances being at the same time conducted on the left flank and to the front.

On the 27th the force and the Head-quarters moved to Haiklezai, where it had been ascertained there was a suitable open position and where supplies were obtainable from the surrounding villages. On the same day, having transferred the command of the main body to the senior Officer present, Colonel Pigott, of the 70th Regiment, I joined Colonel Clay's reconnoitring column, and set it in motion towards the north-east along the border of the province. I was accompanied by Colonel Browne, R.E., an excellent reconnoitring Officer, well acquainted with Pushtoo and the Kakur tribes.

The object of this reconnaissance was to make our presence felt on the Kakur border, to examine the passes leading towards Sibi and to the historical Tal-Chotiali route, and at the same time to define the limits of the plains of the province along the east and north-east.

This reconnaissance terminated at Kushdil Khan Ka Killa, and was

very successful. The information gained opened the way for the movement of a column in the following spring, which completed the examination of the whole country from Pishin to Rajanpur and Dera-Ghazi-Khan.

Haiklezai.

At Haiklezai the main column halted until the 8th December. The instructions issued to me were scanty, and it may be well to mention here that it was not intended that I should move on to Kandahar until I was joined by the 1st Division, now on the march under command of General D. Stewart.

During the period the force was at Haiklezai, reconnaissances were made to the Kojuk, to the mouth of the Gwaja, and Lieutenant Wells, R.E., was directed to march through the Gazabund Pass from Quetta direct on Gulistan Karez, and to prepare the route for the passage of General Stewart's artillery, with a party of Ghilzai excavators.

About this time the organization was rendered more complete by the arrival of the Brigadiers :—Brigadier-General C. H. Palliser, C.B., Cavalry Brigade; Brigadier-General R. Lacy, 1st Infantry Brigade; Brigadier-General T. Nuthall, 2nd Infantry Brigade.

General Nuthall was sent to Abdulla Khan Ka Killa to command the advance guard, General Palliser to Kushdil Khan Ka Killa to command Colonel Clay's force, and General Lacy commanded the Head-quarter column.

So far the season was most favourable, no rain or snow had fallen, as generally is the case at this time of the year; latterly, however, overcast days reminded us that snow might hamper our movements, and impelled me to endeavour to get the force over the Kojuk while fine weather lasted.

At Haiklezai a post was temporarily established in some farm buildings. A small garrison was placed in Kushdil Khan Ka Killa, and a cavalry post was fixed at Sayad Yaru Karez. These three posts were ordered to circulate reports of their well-being or otherwise, and were intended to act as a link in the line of communications.

On my commencing to exercise command at Quetta, I published a notification to the force that actual manual labour of the troops of all corps, native and European, must form a very considerable part of our daily duty. Officers were to devote themselves to the intelligent execution of the works which would be pointed out by the Engineer Officers. I am happy to say that my views were thoroughly appreciated, and the energy and intelligence displayed by all corps were now destined to bear good fruits.

The movements which preceded the operations on the Kojuk were the examination in a preliminary manner of the Gwaja and the country to the south of Pishin. This reconnaissance and an excursion of a small party to the top of the Kojuk, enabled me to judge of the comparative merits of the passes, and to decide to operate on the Kojuk, which proved to be the most direct line from my

position, leading through the best watered and most productive country.

The plain of Abdulla Khan Ka Killa affords an encampment suitable for a lengthened halt, and there I settled the main body of the force on the 12th December.

At the same time a post was formed at the very foot of the pass, at a place called, in the old account, Churza, by us named Kojuk camp.

This post, destined to be occupied by camps of working parties, by the successive portions of the force and by convoys, was the upper portion of the Kojuk Nulla, which at about two miles from the summit is hemmed in by hills and only just wide enough for a line of encampments and a roadway. From Abdulla Khan to the camp, the natural bed of the nulla answered all purposes of a road, but the $1\frac{1}{4}$ miles to the crest and the steep descent on the north side required a good deal of labour. At the foot of the north steep slope a nulla is reached, which descends by a uniform gradient to Chaman, about $2\frac{1}{4}$ miles from the foot of the abrupt portion.

An examination of the pass by Colonels Hichens and Browne, R.E., enabled us to judge on the 11th where to apply our labour, and on the 12th a column commanded by Colonel Kennedy, 2nd Punjab Cavalry, was located at the Kojuk Pass, and the works commenced.

In the meantime Palliser's column was moved along the Daman road, reconnoitring and feeding itself, and ordering supplies to be concentrated at Abdulla Khan. The course of this column was now directed across our rear to Gulistan Karez, in view to its holding there a point of observation, and carrying out a more complete examination of the Gwaja Pass.

It was during this period that Captain Hanna, of the Quartermaster-General's Department, collated the materials from the several reconnoitring bodies to form a map of Pishin, which had now been fairly well explored. At starting there was no special survey party, and our method was rough, but effective. Colonel Browne gave the points of the principal mountains, and these were transferred to Officers who accompanied the reconnaissance columns, and the work was executed rapidly by taking cross bearings.

I may say here, that we had no reliable maps of the country, and those we possessed were of old date, and gave very wrong impressions.

The first operation at Camp Kojuk was to improve the water supply, which was done by making pools in the gorge, into which the springs trickled at the side of the track. As the water was only found high up in the narrow gorge, the watering of so many animals and men occasioned blocks and inconvenience, and hours for watering were arranged.

The tracks found on the Kojuk were only fit for footmen, mules, or donkeys. A few camels struggled over, but for laden camels and wheeled artillery the pass was absolutely impracticable. It was decided to improve the steep gorge to the top, and bring the old zigzag of 1839–42 again into use for the passage of the first detachments.

Colonel Hichens, assisted by Captain Nicholson and his field park, opened operations on the road-making of the pass on the 13th. The troops set to this work were the 5th and 9th Companies of Sappers under Lieutenants Hill, Maxwell, and Sharpe, R.E.; the 32nd Pioneers commanded by Colonel Fellowes, the 26th Punjab Native Infantry, under Lieutenant-Colonel Smith, and the gang of Ghilzais in charge of Lieutenant Wells. Covering the operations Colonel Kennedy reconnoitred with his cavalry beyond the pass, and the 1st Punjab Native Infantry crowned the heights under command of Major Keen.

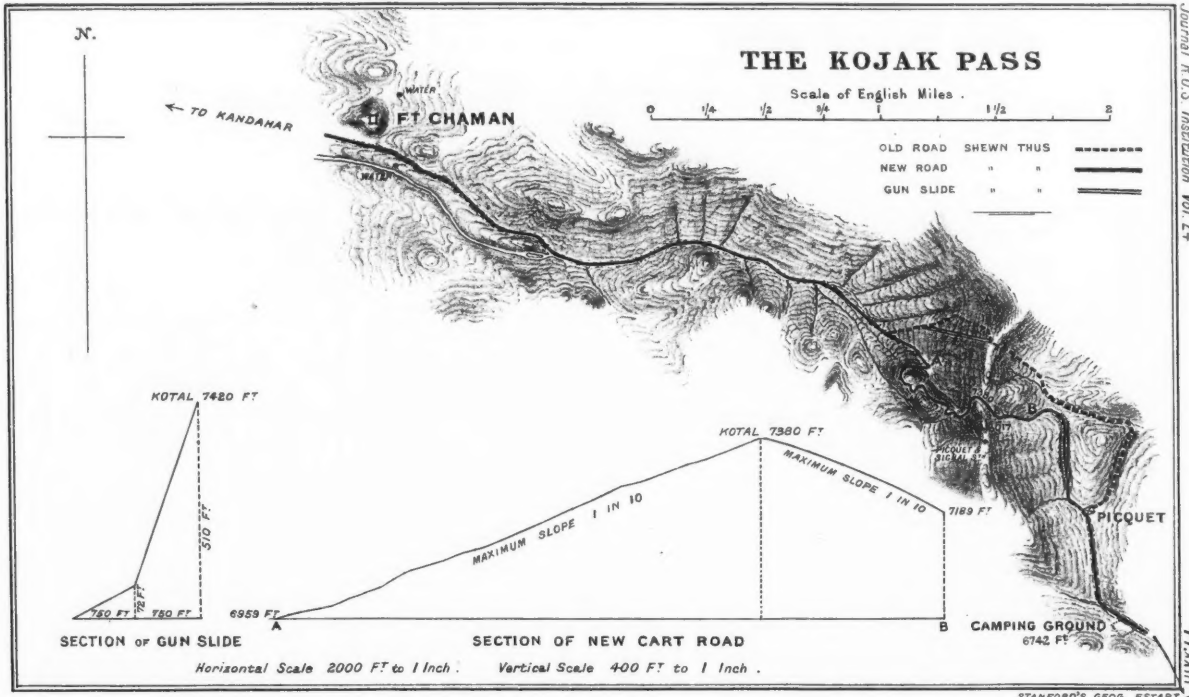
In the gorge on the south side, a good deal of wedging and blasting in a very stubborn formation of rock had to be done, to bring the bed to a sufficient width and equality of gradient for the passage of the guns. This, with much labour and persistency, was accomplished, but though the north slope was a softer strata, its extreme abruptness rendered it impossible, within a given short time, to prepare a road fit for wheeled artillery.

On the evening of the 14th, the pass was reported fit for the passage of infantry and cavalry and mountain guns; and on the 15th Colonel Kennedy moved the advance guard, consisting of the 2nd Punjab Cavalry, the 1st Punjab Native Infantry, and two mountain guns, to Chaman. 450 baggage camels were marched over with no serious accident.

In consultation with Colonel Hichens and Colonel Le Mesurier, we now decided that to pass over wheeled artillery it would take at least a fortnight to make a road for the descent of the guns and wagons, even if the horses were unhooked and the carriages let down by hand. We resolved, therefore, to improve a tolerably straight gully into a ramp, and to let the guns down by ropes, which Captain Nicholson had brought with him. The ramp or slide was at an angle of about 31° and 500 feet long, and had one slight turn in direction. It led from the crest to the commencement of the inclined bed of the valley leading to Chaman. The heights of the several points, and an idea of the roads and slide, may be obtained from the plan furnished by Colonel Hichens accompanying this paper. At the top of the pass, platforms were provided for parking the carriages, and for the party working the ropes. On the 18th the slide was reported fit for the artillery, and on the next day the E Battery, 4th Brigade, commenced to make the descent.

The descent of the guns was a very interesting and satisfactory operation, and was well managed by the Artillery Officers and men assisted by working parties of infantry, under the direction of Colonel Le Mesurier.

The carriages being unlimbered, the operation was performed by sending down a limber, a body, or a gun only, at a time. There was no let or hindrance in the performance; the stout rope was securely attached to the carriage, and one or two men attended in the descent, the rope being held by a working party on the platform. An Officer watched and directed from the top, and another received the carriages at the bottom. At the turn a few men were stationed to change the direction. The carriages were driven up the plateau on to the crest, and



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PL. XXIII. To Kilja Abdulla Khan

were put together again some little distance below the foot of the slide. The passing a battery over took about 1½ days, and though laborious, was completely successful.

In the meantime roads were improved, and some new pathways opened up to provide for return laden camels and general traffic. A Field Officer was appointed as superintendent of traffic, with full control over the pass, having communication by heliograph with stations on both sides of the Kojuk. The passage of convoys was managed on the system adopted at railway stations, and blocks were thus avoided and the free passage regulated.

While on this subject, it may be as well to explain here that from the first it was felt that the operations would not be complete until a proper cart road could be made. A track was therefore surveyed by Colonel Hichens, who set Lieutenant Wells to work with his Ghilzais, and here the party was left to carry out the operation. In the month of March, when I returned over the Kojuk, a 13-foot road was found completed, having a gradient of a maximum of 1 in 10. A train of carts was then making a passage of the Khoja Amran Range laden with telegraph material which had been brought up from Sind. These were the first wheeled vehicles which had ever reached Khorassan from India.

In the midst of the operations on the Kojuk, General—now Sir Donald—Stewart arrived and assumed supreme command, and I remained in command of the advance column, which was constituted as the 2nd Division.

In order to decide on the possibility of making use of the Gwaja Pass, and adapting it to the passage of General Stewart's heavy artillery, a reconnaissance was sent, accompanied by the senior Artillery and Engineer Officers, out through the Gwaja, round by the plains of the north side, and back over the Kojuk, making a complete circuit. The result of this study of both passes caused General Stewart to commence work on the Gwaja, and a portion of my troops was moved there to carry out the operations, under the superintendence of Colonel Sankey, R.E.

As soon as working parties, now much reduced on account of work in the Gwaja, could be spared, a site was chosen for a redoubt at Chaman to guard the exit of the pass and depôt of stores which was being formed there.

The passage of the Kojuk was going on from the 19th to the end of the month without intermission. Three batteries of artillery were brought over in succession, large convoys of 900 laden camels, and the same number of unladen on return were got over. Transit over the pass was reduced to a regular system.

In the meantime the cavalry were occupied in the Kadani Plain at distances up to 25 miles from the Khoja Amran searching for roads, water, and supplies.

The scene on the crest of the pass was now very animated. Every path and zigzag was thronged by streams of troops, laden and unladen camels, going to and fro. Horses were led down to the foot of the slide to be hooked in there. On a pinnacle of the range, Lieutenant

Smith, of the 70th Regiment, with signallers of his corps and of the 11-11 Battery, were carrying on a complicated correspondence with five stations, two of the cavalry brigade in the Kadani plain, one at Chaman, one at Kojuk camp, and one at Killa Abdulla. Gulistan Karez was now connected with that place by a cable. We were not well supplied with heliograph instruments, and could have used many more. Fortunately Captain Bishop, 2nd Punjab Cavalry, assisted us ably with one of his own. Altogether the heliograph did us good service at this particular time.

On the departure of the Army from Pishin towards Kandahar, the Gwaja route having been used by the heavy artillery, was abandoned, and the Kojuk became the established route.

The maintenance of our line of communication was provided for in the first instance by placing the 1st Punjab Native Infantry, Major Keen, at Gulistan Karez, as the first instalment of a movable column for Pishin. A company of the same regiment was detached under command of Captain Lorne Campbell, and located on the Kojuk, where on the crest a picket was placed and maintained day and night throughout the whole winter. This arduous duty was performed with great steadiness and devotion in a very severe climate.

At Chaman the fort was gradually improved, and a small force of all arms was stationed to watch the north end of the pass at that place. On the road to Kandahar detachments of 40 cavalry were posted at intervals of about two marches.

Hitherto our proceedings had not been interfered with by either the Kakurs or Achukzais. The Kakurs once threatened our post in the Sayad Yaru Plain, but a prompt movement had warded off the blow. The Achukzais declared openly that they only waited for an opportunity when the columns should have marched on towards Kandahar to commence their enterprises.

In the latter days of December we were engaged in the passage of the Kojuk, which gave a full measure of daily occupation to the engineers and to the Staff, as well as to the Commissariat and Transport Departments, and to the troops crossing over to Chaman. About this time a redistribution of troops took place, consequent on the passage of some of General Stewart's troops by the Kojuk, and the employment of mine in the Gwaja. Cavalry posts beyond Chaman were placed under charge of Major Clifford, 2nd Punjab Cavalry, and letter-carrying from the Indus to the limits of Pishin was arranged for by Major Sandeman, by native levies.

By the troops at Abdulla Khan, Christmas Day was observed as a holiday. Extra rations were served out, wood for cooking and for bonfires was collected, and every Officer and soldier enjoyed a good plain dinner, and the warmth and light of the camp fire. All were overjoyed at the prospect of a speedy advance, and full of the hope of adventure. Orders were issued by General Stewart, from his Headquarters at Gulistan Karez, for the march of the whole force by divisions, the first through the Gwaja, and the second division through the Kojuk. On the third day concentration was to be made at Takhtipul. European troops were to take 15 days, and native troops

7 days' supplies. Corps proceeding by the Gwaja were to carry firewood.

On the 1st January General Palliser, commanding the cavalry, was one or two marches in advance, in the plains of Kadani. Half of the cavalry, with 3 guns of A-B Royal Horse Artillery, to each body, was in front of each of the passes. The advance guard in my front was commanded by Colonel Kennedy.

Previous to the onward movement, Palliser's line was strengthened by the Sapper companies, Pioneers, Baluchis, and 25th Native Infantry. The engineer parks were also moved to the front.

On the 2nd January Palliser's force took up the line, Shah Pussund and Fatti Ulla Khan, and reconnoitred into the Mêl Valley.

The troops of the main body of the 2nd Division were told off into two columns; the leading one commanded by Brigadier-General Nuthall, the rear column commanded by Brigadier-General Lacy.

Now so long as our columns were stationary, while General Stewart was at Gulistan Karez, the intercommunication between the divisional headquarters was very perfect, but directly the movement began, although we were only separated by about 25 miles of direct distance, all communication ceased. Between our advance column and myself correspondence was well established and maintained throughout the march, I was able during the first two days to receive but scanty information from General Stewart's Head-quarters.

The reason of this was because the country was intricate. Mounted guides could not be procured, and signallers and heliographs were not supplied in sufficient numbers. Further, we found it to be exceedingly difficult without pre-arranged points to pick up chance flashes from distant stations whose positions we were not accurately informed of.

Although we had no enemy to contend with, the movement we were making was one of great interest, the overcoming the difficulties which arose in procuring supplies, the actual marching and care of baggage, and the mastering the physical difficulties of the country, excited a healthy spirit of energy in all ranks. At the same time there was a satisfaction in clearing away from the passes, which had delayed us so long.

On the 1st January the 2nd Division Head-quarters moved to Chaman, and on the 3rd General Nuthall's column, which I joined, commenced the march. General Lacy was ordered to follow on the 4th.

We were now crossing the great plains which are spread out like a glacis in front of the Khoja Amran. On the left of General Stewart's line of march lay the desert, and on my right, the Kadani Valley appeared an open country for many marches. As this valley had not been sufficiently reconnoitred, I deemed it requisite to watch and patrol in that direction with great care.

On the 5th January Colonel Kennedy met the enemy's cavalry at the Glo Kotal. He drove them through the pass with some loss on their part, and retreating into the Takhtipul Plain, the Afghan horse were met by a squadron of the 15th Hussars under Major Luck, who

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charged and dispersed them; 12 or 13 Afghans were killed and some prisoners taken.

On the line of advance of the other column, there was also an engagement with the enemy, who withdrew with some loss and retreated on Kandahar. This first encounter with the Afghan troops did not promise to us the sturdy resistance we had hoped for.

The concentration was effected at Takhtipul, and preparations were made for the entry from the Turnak Valley into the Kandahar Plain by two passes, where resistance was expected. On the march to the Turnak the information reached us from General Stewart, who was in front, that Mir Afzul had fled, and that the Kandahar troops had dispersed or followed him. The city was open to our entry, and the people prayed for the advance of the troops to keep order, lest there should be a reign of terror.

On the 8th the force made a ceremonial march through the city, and, delayed by the intricacy of the road, the rear guard did not reach camp till long after dark. The whole force encamped in the open plain in one line facing Ghazni, and enjoyed a short repose after their recent continued exertions.

As we left the country of the Achukzais to the guardianship of the posts on the Kojuk and the neighbourhood, they thought the time had arrived when they might conveniently enter on their operations. The first act committed by them was the murder of a native commissariat clerk and two sepoys, who happened to be detached. One sepoy escaped to tell the tale.

After this deed of prowess, the Achukzais were encouraged to combine together to attack a convoy guard of the 1st Punjab Native Infantry, which was encamped for a night at Killa Abdulla Khan.

The Subudar commanding, a Khuttuk Pathan, by name Faiztullub, proved to be a man of the right sort. Having some information of the threatened attack which was to take place after nightfall, Faiztullub made arrangements to strike his tents after dusk. The 40 sepoys with him were ordered to lie snug and quiet watching for the enemy. As soon as the Achukzais, several hundred strong, drew near, the sepoys opened fire. The attack was made with determination, and the resistance of Faiztullub and his men was stout. Some of the enemy were shot and bayoneted at close quarters, and having had enough, the Achukzais withdrew. I afterwards thanked Faiztullub in the presence of the regiment for the fine service he had rendered on our communications at an important time.

Not long after this affair, our convoys were molested and robbed in the Kadani Plain, near Chaman, by Lushkur Khan, who, with his sons and clansmen of the Achukzais, had long been a terror to the whole country.

On the march of the troops from Chaman, I had been careful to instruct the Officer commanding the small garrison there not to allow himself to be enticed into any action at a distance from his post. It would seem, therefore, that on the perpetration of an outrage by Lushkur Khan, Lieutenant Wells, R.E., and a medical Officer, attended by a few sowars, volunteered to go and punish the gang of banditti.

Now the position of the small posts on the Kojuk was not an enviable one. They were surrounded with mountains which might at any moment afford a screen behind which a body of Achukzais might assemble with the view of assailing all points at the same moment. Any sign of weakness on the part of our people might have led to the most serious consequences. I have no doubt that this feeling was held by every Officer there.

The banditti were numerous and defiant, and made light of so apparently insignificant an enemy. Lushkur Khan being summoned to surrender, refused, and was attacked by Wells and his companions, and the bandit and his sons died fighting. This affair, which was a gallant act, caused rejoicing throughout all the country side, even as far as Kandahar, where the merchants felt that there was one notorious robber the less to lay contributions on their kafilas.

After these lessons, the Achukzais remained quiet, and they subsequently rendered good service through the instrumentality of Major Sandeman, in charge of the very communications which they had commenced to molest.

Kandahar to the Helmund.

As it is beyond the intention of this lecture to detail the whole of the features of so extended a march, I pass hastily over the movement from the Kojuk on Kandahar. The opposition made at Takhtipul was insignificant, and the flight of Mir Afzul Khan and the dispersion of the Afghan troops opened the way for the peaceable entry of the columns under General Stewart's command on the 8th January. We had only arrived in time; any delay might have caused grave disorder and bloodshed.

The Hindoos and traders welcomed us warmly, and business was resumed. The attitude of the people in general was impassive. Those of Persian origin showed marked signs of satisfaction at our presence.

From the 8th to the 14th, the 2nd Division was occupied in preparations for a movement to the Helmund. The sick and those in any way unfit for the march were cared for and left behind. Unnecessary native followers were sent back to India, and the Commissariat and Transport Services were more perfectly organized. In all these matters we were very busy.

The 2nd Division lent the services of Brigadier-General Nuthall, who was appointed to the command of the garrison of Kandahar. Captain Bisset, who had done such good service on the march and at Quetta, was left to undertake the serious task of putting the fort and palace, which was in a state of dirt, decay, and confusion, into a condition suitable for hospitals and the many requirements of an army.

On the 15th January General Stewart with the 1st Division marched towards Kelat-i-Ghilzai.

The 2nd Division having given some corps to form the Kandahar garrison now consisted of the following:—

5th and 10th Companies Bengal Sappers, to which was attached a train of 2 pontoon boats.

The Engineer field park;—mule train.

I Battery 1st Brigade Royal Artillery.

2 guns 11th Battery 11th Brigade;—mountain train.

4 guns No. 3 Peshawur Mountain Battery.

2nd Punjab Cavalry, Kennedy.

3rd Sind Horse, Malcolmson.

70th Foot, Pigott.

Half a battalion 19th Bengal Native Infantry.

29th Bombay Native Infantry; 2nd Baluchis.

32nd Bengal Native Infantry, Pioneers.

Brigadier-General Palliser, C.B., commanded the cavalry and fell into command of the advance column. Brigadier-General Lacy commanded the infantry, and ultimately the rear column.

The division received several additions to the Staff.

Lieutenant-Colonel H. Moore, C.I.E., was constituted Political Officer to the force, and organized a staff of native officials, Afghan sowars, and a postal service.

The Commissariat Staff was completed and placed under the charge of Captain Luckhardt, who was assisted by three other Officers of the Department. Although the camels had suffered severely from the severe cold, privations, and constant movement, they were somewhat rested. The system of regimental care was better understood and practised. The camels were, however, after all weak, and required warmth and repose. Eventually we were able, on the march to the Helmund, to add to their number by purchasing strong hardy Khorassan camels from the edge of the desert, and bullocks and donkeys were also brought into use.

The Survey Department was now represented by Captain Beavan, who had with him a regular staff of assistants.

Captain Dickie, R.E., was in charge of heliographs and signalling.

On the 10th, in company with Captain Stewart, I examined the road to and camping ground at Kokeran, and ordered the roads to be prepared for the artillery. The suburbs of Kandahar have never been traversed by wheels, and the streets of the villages, and the bridges over watercourses, are narrow and not fitted for wheels.

On the 14th General Palliser moved the cavalry to Kokeran, with orders to commence the operation of collecting supplies and to pave the way for the march of the main body.

I understood the movement towards the Helmund was made as a reconnaissance in force, with the object of opening new sources of supply, and with the view at the same time of withdrawing a large portion of the troops from consuming the products of the immediate neighbourhood of Kandahar, and the food being brought from India.

As regards time, I conceived we were under no pressure. The obligation appeared to be to regulate the movement so that leisure should be afforded to admit of the collection of supplies of food without causing violent measures and unnecessary excitement among the people. Colonel Moore entered fully into those views, and, accom-

panying the advance guard, organized a system of dealing with the inhabitants as far as possible through the Malicks of the principal villages.

In addition to the necessity there was to march leisurely, to give time for the collection of supplies, it was obligatory to husband the strength of our camels by giving them repose and time for grazing. Halts of one or two days were made according as we found the country able to support us, and the days of halting were fully occupied in reconnoitring, survey work, and collecting food.

On the 16th January, the Head-quarters and the main body of the 2nd Division commenced the march to the Helmund, and encamped at Kokeran. The situation of the camp, looking up the Argandab Valley, was lovely. The troops were in the highest spirits at escaping from the neighbourhood of Kandahar, and ready for a movement into new scenes, and for any adventure which might turn up. Some were ardent enough to expect we might reach Herat.

On the 17th, the Sappers and Pioneers, under the Engineers, prepared ramps to the ford over the Argandab, and improved the roads through the cultivated grounds on the right bank. The 32nd Pioneers joined General Palliser at Sinjuri the same evening.

On the 18th, General Lacy and Divisional Head-quarters moved to Sinjuri. General Palliser made a march forward, and the advance column was thus regulated in subordination to the movement of the main body.

On the 23rd, General Lacy reached Atta Karez, about 31 miles from Kandahar. Between Sinjuri and Atta Karez the country is one vast skirt of the mountains, and no road making was necessary; all the obstructions were between Kokeran and Sinjuri, in the neighbourhood of the river.

At Atta Karez I felt that we were about to quit the broad alluvial cultivated lands of the Doaba, and enter on the narrow strip of productive country lying along the Argandab. Two roads strike off from here to Girishk; of these I chose that along the Argandab for the march of the division, as it passed through a comparatively better supplied district.

In order to watch the country on our right flank, and to reconnoitre the direct road to the Helmund, I sent a small force under command of Colonel Tanner, 2nd Baluchis, with orders to conform his movements to that of the leading column. With this view the flank guard moved to Chaoni, at Kishki Nakhud on the 25th. On the same day the main column moved to Killa Saidal.

During the days which preceded this movement, the whole of the Doab of the Argandab and Dori rivers was overrun and surveyed, and I seized an opportunity myself of visiting a remarkable point on the edge of the desert where the Dori passes through an important gap in the hills.

As we proceeded westwards and reached a less productive country, it was perceived that there would be great difficulty in making the move of the whole force to Girishk in one body.

I therefore joined General Palliser's column, and at the same time

reinforced it with the Peshawur Mountain Battery, the 10th Company Sappers, and the pontoons. At the same time General Lacy, who had reached a more forward position, was ordered to move back to the neighbourhood of Atta Karez and Hauz-i-Muddud Khan, where supplies were more plentiful. The operation of reaching the Helmund was complicated by the completely unproductive nature of the country between Bala Khana and Abbaza, a village on the left bank opposite to Girishk.

A reconnaissance was made to Abbaza, and the principal personage of Girishk summoned to our assistance.

On the 29th I made a reconnaissance in force, forded the Helmund, visited the castle, selected positions for camps, and returned to Bala Khana.

On the 30th an advanced guard, under Colonel Kennedy, composed of 2nd Punjab Cavalry, the Engineers, Sappers, and Pioneers, encamped at Abbaza (erroneously called Obostan in some of the reports). At the same time Colonel Tanner with the flank guard came in from the north direct road. Colonel Moore, and his native officials and the Commissariat Officers, at once proceeded to gather in supplies on both banks of the river.

On the 31st the advance column was further augmented by the movement of Colonel Nicholetts with half a battalion of his corps, the 2nd Baluchis. A position was taken up on the cliff above Abbaza for the Head-quarter camp, which was supported by a detachment of cavalry, the Peshawur Mountain Battery, and the Baluchis.

The fort of Girishk, though dilapidated, proved of much service as a military post. Colonel Tanner was constituted commandant with a small garrison of Baluchis and Pioneers. Shelter was there found for the sick of the advance guard, for a commissariat store, and the garrison.

In a few days the advance guard was settled in a position on the open plain facing Herat, a little to the south of the castle. General Palliser commanded on the right bank, and had in camp with him the 2nd Punjab Cavalry, 3rd Sind Horse, the Sappers and the Pioneers. Detachments of the two latter corps were posted on either bank of the river, who, assisted by hired boatmen of Abbaza, managed the operations of the ferry.

In the flight of Mir Afzul, attempts had been made to destroy all the ferry boats; the boatmen, however, hid one by sinking it, and the boat, having been produced, was exceedingly useful to us. Colonel Hichens placed all the business of the ferry under charge of Lieutenant Browne, R.E. Hawsers were stretched from bank to bank, and a pontoon raft and the ferry boat were hauled over and back by gangs of boatmen. This method answered completely, and the ferry was a busy scene of traffic from daylight to nightfall.

At this season we found the river about $3\frac{1}{2}$ to 4 feet deep at the ford; the current was strong. The ford led diagonally across the stream, and any deviation from the track led into deep water. After passing the main stream a branch was found also deep and flowing swiftly. The passage of the river required great care and precaution;

all the baggage had to be transported by the ferry. Unladen camels and mounted Officers and cavalry crossed easily. Infantry passed over the ferry.

Altogether the passage of the river was a serious obstacle, and occupied our attention continually. Colonel Hichens commenced making a bridge out of the rough timber found in the valley, but we were recalled before we could complete it.

Gradually roads were constructed, fit for wheeled artillery, leading from the plateau to the river and across the valley to the camp of the advance guard. Until this road was complete the inter-communication by narrow winding paths over watercourses was very intricate, and it was almost impassable between the two positions at night. The road, however, added much to our security. It was straight and broad, and perfectly traversable at all hours. Heliographic communication provided a means of correspondence by day, but at night we required signal lights, and these we were improvising just as our stay came to an end.

The position on the Helmund is very different from what I was led to suppose it to be from a study of the maps. There are no hills at Girishk. The formation there, is as described in Part 1: a vast plain elevated about 50 feet above the alluvial valley, which is about two miles wide. From our position on the cliff above Abbaza, we dominated both ford and ferry, and the whole valley up to the advance guard camp and the castle of Girishk. Promontories which jut out encircle the Abbaza reach of the river, and present fine positions for covering the passages by infantry and artillery fire.

There are other passages of the Helmund, both above and below Girishk, but the one at Abbaza seems to be at present the safest, and this is the passage most commonly used. At Kaji Byuk, two miles above Abbaza, there is a ford, but it is deeper and more intricate. It stands at the end of the north road, and is commanded by favourable ground from the left bank. These features gave security to our position. The Head-quarter camp commanded the passages; nevertheless our situation was critical, divided as we were by such an obstacle as lay between the two camps. Zamindawar, the country of the Alizais, a warlike tribe, was only 25 miles distant. There were signs of excitement in that quarter, and a blow was threatened on both banks at the same time. Had an attack been made, we should have been found weak in numbers, as the troops were much occupied in distant expeditions, reconnoitring, and bringing in supplies.

My instructions were to avoid all enterprises which might cause irritation to the inhabitants, and it was a nice matter to conduct our search for food in such a manner, so as to stop short of actual force.

In the work of completing the passages of the river, in survey, and reconnaissance duties, and in the matters of supply, every Officer, soldier, follower, and animal of the force was fully engaged day by day. It was a season of constant activity. At the same time the imperative duties of watch and guard reduced the hours of repose.

The season spent in this distant part was cheered by adventure and by the knowledge that our labours were recognised. In these days an

order was published by General Stewart conveying the satisfaction of the Viceroy at the conduct of the operations as far as Kandahar. "Accept and convey to the troops my warm congratulations on entry "into Kandahar and successful accomplishment of the long and "arduous march from the Indus to that city." For myself and others there were signs of the interest of many friends who were earnestly watching our movements.

We maintained our position on the Helmund till the 23rd of February, when the force retired. Although it had been my wish to render the situation more secure, I was not able to move up reinforcements on account of the difficulty of supply. An order was issued for the march to the front of the 70th, and two guns of 11-11, but our recall obliged me to counter-order the movement.

Our retirement proved to be part of a scheme for the reduction of the numbers of the troops in Afghanistan before the hot weather should set in, a measure framed on the idea that matters were about to be permanently settled. It was a movement which caused a bitter feeling of disappointment to every Officer and soldier of the force, to myself, and some of the Staff and troops. There was some solace found in hearing that we were to explore the entirely unknown country between Pishin and the Derajat on our return march.

During our stay at Abbaza reconnaissances were pushed for two or three marches towards Herat, both on the road which leads through Washir and on those which are directed on Kash and Furrah.

Careful surveys were made up the valley of the Helmund to the border of Zamindawar and to Sungin on the left bank. To the south we thoroughly explored the Doab to Kala Bist, and the valley for some distance below that place.

While on the excursion to this most interesting ancient city, on the history of which my friend, Colonel Yule, has furnished me a paper for the Appendix, information reached me of the excitement of the Alizais and other tribes, and of threatened attacks. The number of the troops at Girishk being much reduced by the absence of the reconnoitring columns, I passed the Helmund a mile above Kala Bist, fording the river with mountain guns and infantry, and made a forced march up to Girishk to strengthen General Palliser's position. We reached Abbaza on the 19th; the remaining four days, till our departure, were occupied in withdrawing the sick and impedimenta from the right bank, and in watching for a convoy expected from a distance of 40 miles down the Helmund, and one from Kandahar, which should provide the supplies necessary for the march. During these days strong reconnaissances touched the Zamindawar border daily, and formed junctions with the expected convoys.

These precautions were sufficient to ward off the intended attack for a time, and we left the Helmund without interference.

It was part of the plan of the retirement that, while the main body was gaining the road towards Kishki Nakhud, Colonel Malcolmson should watch the fords from Zamindawar in the neighbourhood of Surwan Kala and Sungin. Colonel Malcolmson had orders to time his withdrawal so as to keep one march in rear of Palliser's column,

acting as rear guard. In the meantime, the 70th Regiment being required to return to India, Lacy's column was put in movement towards Kandahar. On the 26th, Palliser was at Atta Karez, while Malcolmson and Tanner reached Kishki Nakhud.

That evening Malcolmson was suddenly attacked by 1,500 Alizais and others. The enemy had marched diagonally 30 miles that day along the foot of the hills, approaching the camp with caution, and giving very little notice of their advance. Malcolmson and Tanner, however, with their Officers and men, were full of fight, quite ready for the occasion. A severe lesson was administered. I had to regret the loss of Major Reynolds, 3rd Sind Horse, a gallant and talented Officer, and a few sowars killed. The enemy lost 150 men.

While at Kishki Nakhud I very carefully studied the position which I describe as the trilateral of Atta Karez, Kishki Nakhud, Killa Suidal.

Kishki Nakhud is situated at the entrance to the Mainwand and Khakrez Valleys. A fair way leads towards Zamindawar from here *viâ* Gurmab, and a column which might be directed from there towards Kandahar would have to make for Kishki Nakhud in order to pass round the spur which terminates there.[1]

Strategic Considerations of the Country to the West of Kandahar.

The Helmund country, known as the Pusht-i-Rud Government, extends from the slopes of the Sia Koh and the Musa-Helmund Doab or Zamindawar down to Gurmsel, which is the district about Bost. To the westward the boundary is the Kash Rud.

The acquisition of this province, so valuable on account of its produce, would be the first aim of an invader marching from Herat.

It is not easy to understand how any columns of any considerable magnitude could commence a movement either from Persia through Seistan or from Herat without due preparation in gathering supplies at all the stages, as far as this could be done unopposed. Such operations would cause a great stir throughout the whole country, and early and full information would surely be given of any contemplated advance. We know now by experience that marches of considerable bodies of troops cannot be made through such countries without proper precautions which take time to carry into effect.

The concentration of an army having been made, and the provisions, munitions, and war *matériel* having been prepared (no small undertaking in the centre of Asia), the invader may direct his column along three roads, viz., the northern one *viâ* Washir, the middle one *viâ* Furrah, or the south one, which follows the great bend of the Helmund. This latter route as it passes through a belt of country fairly well provided with four great requirements—water, food for troops, grass and food for animals, and firewood—would surely be used for a great

[1] It should be understood that mountain ranges, spurs, and isolated hills are generally throughout all Khorassan quite impracticable for extensive military operations on account of want of water, and their extremely rugged formation.

portion of the force. This gives to Bost and its neighbourhood the importance which it has held in all ages.

The position of Girishk-Abbaza is with the most modest precaution unassailable. Those of the Upper Helmund can only be gained by the invader exposing his right flank, and he could not therefore avoid retaining or attacking Girishk.

The defenders would think it wise not to oppose any serious resistance on the Kash Rud beyond that which is necessary to oblige his enemy to show his hand, and to harass his advance.

The line of the Helmund, though extending for 75 miles, has many good positions, so that all the passages of the river can be defended by suitable works at short notice. These are now all pretty well studied, and works could be constructed at once if the material were at hand.

The position for locating the main defences would be at the trilateral of Atta Karez; and the troops in support would be well placed on the communications in the vicinity of the Argandab Valley and the Doaba.

The Helmund would therefore be considered the first line, and Kishki Nakhud, Saidal Killa, Atta Karez, the second line of defence. If a third line should be necessary, one may be found on the arc which extends from the desert edge, at the point where the Dori escapes from the hills along a semicircle, passing through Sung Hissar, Sinjuri, and Khwak. Within this semicircle are to be found all the obstructions which encumber the country to the west of Kandahar. Inside the arc lies also all the productive country, while without it the country is sterile and an open glacis.

Such is the nature of the country immediately west of Kandahar. Here the great route from Central Asia to India, which has less physical obstacles than any other, passes through a narrow gateway. It seems to me that even though invasion may be remote, the possession of this point has an importance which cannot be rated too highly. The province is rich and well able to supply all the food necessary for an army.

It is unnecessary to follow here further the course of the march to Kandahar. On our arrival the 2nd Division was broken up, some of the corps and the Staff with myself were hastened off to return to India by the new route. We left our comrades behind with deepest regret.

Part 4.

The Return March to the Indus.

Introduction.

While on the Helmund, about the 15th of February I received through Lieutenant-General Stewart the orders of Government for the return to India of certain corps by the Tal-Chotiali route, and the importance of carrying out the movement before the great heat might

set in was impressed on me. On the 1st March I reached Kandahar, and having written despatches and broken up the division and set corps in movement towards Pishin, I with my Staff left Kandahar on the 7th idem.

The Tal-Chotiali route, which, on account of our position at Quetta, had become interesting, had been studied so far as it could be without actual examination, by reading the histories translated by Raferty, and by the examination of native guides.

In the old accounts we learned that in the reign of Akbar carriers are said to have been in the constant habit of reaching Mooltan from Kandahar by this route in six days, and on one occasion a distinguished traveller of the Royal clan made the journey on a riding camel to Kandahar in eight days.

The expedition of Muhammad-i-Dara Shukoh, in 1653, against Kandahar—"one of the keys of India"—was made through this same country. We know that with his army, which numbered 104,000 men (besides followers), 70,000 being cavalry, Dara Shukoh took considerable munitions of war; among these there were 10 siege guns and 30 of smaller calibre, also 30,000 shot, 60,000 lbs. lead, and 200,000 lbs. of gunpowder.

To know that these routes had been of so great use was an excitement to the investigation of the country with the view of again making them available.

The march across Pishin from the Kojuk to Balozai gave me an opportunity of extending explorations and of maturing my early impressions of the value of Pishin as a military position. The examination of the country between Pishin and the Derajat added to my knowledge of the country, and the conclusions I have come to after a year of consideration are as follows.

The position at Quetta, taken up to support our relations with Kelat, was a most important starting point for the movement on Kandahar, but the Quetta Plain, being only the vestibule to the greater plain of Pishin, is quite incomplete and faulty by itself. Quetta commands the Bolan only, failing altogether to exert any influence on the passes of the Khoja Amran, or on those of the Kakur country in various directions back to the plains of India.

If we stand in imagination on the summit of the Khoja Amran we understand that we are really on the rampart which nature has given to the Pishin-Quetta plateau. Besides this there is no other great physical obstacle between the Bolan and Kandahar. In front of this rampart the Kadani Plain, glacis-like, is spread out, touching the desert on the left, open towards Kandahar to the front, and stretching up towards Maruf and Kelat-i-Ghilzai to the right. The Khoja Amran belongs to the Pishin position, and the possessor of it uses the routes in front of it or closes them at his pleasure.

If we turn to Balozai on the extreme north-east corner of the Pishin Plain, we find a position of the highest importance. As described in the earlier part of this lecture, and more fully in my paper published in the April number of the "Royal Geographical Society's Journal," Balozai is situated at a meeting of plains and valleys.

From here there are fair open vales descending gradually towards Quetta and Pishin, and close by we find the passes which lead to Zhob, Bori, and Tal. At Gwal, 13 miles south on the road to Quetta, lies the exit of the routes to Sibi and to Tal. Quetta fails entirely to command these passes, while Balozai does so perfectly.

The further requirements of a military position are not wanting. The continuous plains are suited for the action and watching of cavalry, and present routes in every direction for internal communication. The produce of the country in flocks and grain is considerable and will increase, and the neighbouring valleys on all sides will contribute to the market which a military occupation will give rise to. The climate has extremes of cold and heat, but the elevation tempers the heat, and the surrounding hills and high plateau afford sites for residence in a charming summer climate.

No country is without some imperfections. The *désagrements* of Pishin which were not experienced by us, as we were in constant movement, are those which all settlers must find in new countries.

Jacobabad could not have been a very pleasant residence when Jacob first pitched his tent there; yet now the Officer and soldier on watch at Chaman or Killa Kushdil Khan, in spite of the fierce heats which he knows reign in the valley of the Indus, sighs for this more mature settlement.

Object of the March.

In regard to the conduct of the operations, the following instructions were issued for guidance. The examination will embrace—

I. A general survey.
II. Careful consideration with reference to the construction of a military road and railway.
III. Examination of routes with reference to the movement of troops.
IV. Choice of a suitable site in a commanding position at a proper elevation, well supplied with food and water for a standing military post.

Position territorially to be subordinate to the above considerations.

Organization and Movements.

The organization of the expedition was arranged between Genera Stewart and Major Sandeman, under the orders of Government, to be carried out in the manner following:—Three columns were to move in succession from Pishin towards the Barkhan Plain. A column commanded by Colonel Prendergast, with Mr. Fryer, Political Officer, was to take supplies to Legari-Barkhan, and act as a point of appui. Major Sandeman was to act as Political Officer and march with the first column from Balozai.

The constitution of the columns is given in the Appendix.

Major F. S. Keen, 1st Punjab Infantry, commanded the first column; Colonel R. Sale Hill, 1st Goorkhas, the second; and Brigadier-General T. Nuthall the third column.

March from Balozai, 2nd Column on the 24th, 3rd Column on the 25th.

I reached Balozai on the 22nd, and completed organization according to the programme, filling up supplies for Europeans for 30 days and for natives for 7 days. The 2nd column, with which the head-quarters marched, left on the 24th, General Nuthall followed on the 25th. Major Keen's column, with Major Sandeman, were at this date several marches *en route*.

The movement was carried out without serious opposition until Major Keen had reached the Smallan Valley at Baghao on the 6th of March, where he was suddenly and vigorously attacked by the combined tribal force of Zhob, Bori, and the vicinity. Major Keen's dispositions were well made, and the troops behaved with great gallantry, in which all arms bore a part. The enemy was beaten off with considerable loss. Keen's loss was slight.

In the execution of the programme on reaching Biani, where the route to Tal-Chotiali leaves the Bori Valley, I preferred to direct the 2nd column through Bori, while General Nuthall followed Keen through Tal.

This disposition answered my purpose well. I found ample supplies in the Bori Valley and in the country of the Luni Pathans, and the position taken up checked all intention of further hostilities.

Time does not permit me here to trace in detail the movements of this interesting march through a perfectly unexplored country. The march was concluded without any misadventure, and the columns found a few days' repose in the peaceful Barkhan Plain, after incessant watchfulness and continued marching and exploring.

Legari-Barkhan reached on the 8th, 9th, and 11th of April.

The columns arrived in the following order:—The 2nd on the 8th, the 3rd on the 9th, and the 1st on the 11th of April.

From the Barkhan Plain, being in a country absolutely peaceful and friendly, the corps were moved singly by two routes. The 1st Goorkhas and 32nd Pioneers *viâ* the Chachar Pass, and the 15th Hussars, 70th Regiment, and 8th Bengal Cavalry *viâ* Fort Munro. The remainder of the troops were left at Barkhan with the view of establishing a camp at Vatakri.[1]

Movement from Legari-Barkhan, 11th to the 15th of April.

The movement to India from Legari-Barkhan commenced on the 11th, and by the 14th I was able to leave with the Head-quarters. Proceeding by easy marches over a delightful country we reached Fort Munro on the 17th, on the 19th we reached Zeradan. Here we found the heat excessive, 105° in our huts and over 90° at night. The troops suffered much, even marching at night. During the following marches, as we approached the Indus, the country was better clothed

[1] Afterwards broken up.

and cultivated and the heat diminished. The passage of the rivers, however, occasioned a good deal of exposure.

On the 27th we reached the Chenab, and I found here the 70th about to take the train, and I took the opportunity of inspecting the hospital. It was satisfactory to find that, notwithstanding the low condition of the men at starting, now at the close of a march of about 1,200 miles, there were few sick and no serious cases of illness.

The 15th Hussars had reached the rail some days before, and were already *en route* to their old quarters at Meerut. It is due to Colonel Swinley to say that this corps was brought down from the rude country offering so little fodder for horses in excellent condition. The horses were thin but wonderfully well cared for and fit. The men and Officers were in admirable condition.

It is impossible to notice here all corps, where all were so admirable. I must, however, put on record that Charles' Mountain Battery marched to the Helmund and back to the plains of Barkhan without giving a single mule a sore back.

I have now, so far as it is possible in the form of a lecture, traced the principal features of a march of upwards of seven months, from the Indus to the Helmund and back to India. To the Officers and soldiers who accompanied me, I owe a debt of gratitude for the success which attended our operations. It is impossible to speak too highly of the soldierlike virtues exhibited by all ranks throughout the long march. Always ready for action, and patient in hardship, they passed through all these countries without one single act of oppression or impropriety towards the inhabitants, and displayed an intelligence and a keenness in undertaking their several duties, which speaks well for the state of instruction in the corps which composed the forces, and of the Officers in general.

Concluding Remarks.

As the object of war is to secure peace, our aim in this respect will be furthered by our maintaining a hold on the military positions which are most suited to our purpose. It will be, therefore, interesting now to review the considerations which arise out of the study of the country described.

It has been shown how important a position Kandahar holds on the great trade route from Herat to India, how productive are the valleys which surround the city, and how the possessor might close the roads leading to the west and north-east. It should be kept in mind that Kandahar can also be defended against an enemy advancing from the east.

With Kandahar and Pishin in possession, our military position in South Afghanistan would be perfect, and if connected with India by rail, so many objects would be secured, that we might afford to resign other more intricate advanced posts in North Afghanistan. However, whether we hold or cede Kandahar, it is our duty to push on the railway, and Khorassan must be so under control that it may not become the scene of military activity.

Should Kandahar be resigned, the importance of our position in Pishin is much enhanced. In this case it will be incumbent on us to hold the Khoja Amran from some well-defined point on the north edge of the Toba plateau down to where the range terminates in the desert. And to command the range effectually, we must possess the glacis-like plain as far as the left bank of the Kadani stream.

Posts of observation would command in the Kadani plain all the routes leading into South Afghanistan, including the road from Kelat to Kandahar through Sherawak.

This frontier would also secure the entry to the valley leading towards Kelat-i-Ghilzai and Ghazni, and control the hill country lying to the north of Pishin.

All the territory east of the Kadani, *i.e.*, Pishin and Sherawak, would form part of the Empire.

The strength of the Pishin position lies in the great breadth of plain, in the peaceable character of the inhabitants, and in the security given by its left flank resting on the desert.

No military position, however, is perfect, and the defect in that of Pishin is caused by the continuous mountain mass to the north. The belt of mountains to the east is not so much an imperfection; it is narrow, and opens into valleys so arranged that there is no difficulty in moving about them in any desired direction.

As the Quetta position required the addition of Pishin, so the latter also requires something to make it secure, and if it is shown that the improvement can be carried out without incurring embarrassment, it is our plain duty to make the addition.

The communication from Sukkur by the Bolan, even though the rail is now carried up to Sibi, gives only one avenue of approach; it passes through a country exposed to excessive heat; it strikes the position obliquely at one end, and it is exposed in great part to tribes who, though now quiet, cannot always be trusted.

As regards the railway,[1] it will improve our communications vastly, but as from Sibi to Pishin, the line will pass through mountains inhabited by a people not yet settled down; it will not be safe to depend on it without our taking up a position on the north flank of the line.

To an important military position there should be several communications well covered by the position, and passing through a country quiet and friendly. If the people of the country to the rear of the position are likely to be mischievous, they must be held in check by a

[1] The railroad from Sukkur towards Pishin has been laid with the same gauge as that of the Indus Valley line, as far as Sibi, our work having been pushed on over the plain 136 miles in 131 days with extraordinary ability and energy. We are chiefly indebted to Sir Richard Temple, late Governor of Bombay, for originating and carrying into execution the commencement of this most valuable and interesting line of communication. The railway has now to wind up from Sibi through a succession of valleys and ridges, having to rise from about 800 feet up to 6,327 feet in the pass leading into Gwal. It may safely be said that this line will do more than anything else to pacify and civilize the wild countries bordering on the Empire, and it becomes all those interested to foster this, the greatest and most important outcome of our operations.

chain of military posts. Now I fancy no one will guarantee the permanent friendship of the Maris or of the Dumars, and it is quite possible that when the bulk of the army may have withdrawn from the plateau, the tribes will be mischievous, according to old habit.

The Maris raid, and are uneasy principally because they have few lands to cultivate, thus making excursions into the cultivated lands of their neighbours has been naturally their great business in life.

Hence we found when we reached the Kitran country, that the Kitran chief and people were overjoyed to meet us, and hoped that I would place a military post to hold the Maris in check. The Kitrans, though able to hold their own, are exposed, and have broad cultivated lands open to attack.

In the countries of the Lunis and the Turins, and in Bori, the chiefs and people are obliged to be always on the alert, watching for the inroads of the Maris. Every village is a fortlet. Every field has its tower.

Now although the people of the Kakur country are independent, they are without enterprise, they have everything to lose and little to gain by a system of lawless insecurity. The valleys are broad and open, and favour agricultural pursuits, and it would be a charity to introduce the safety from plunder and the security of the roads which our occupation would originate.

The raids and disorders of the Maris and Bugtis have disturbed our border from all time, and their turbulence has given rise to much of the misunderstanding between the British Government and the Khan. Nominally his subjects, yet no Khan has ever been able to exercise complete control over them, and the provinces of the Khanate have suffered more from their inroads than any portion of British territory.

Now so long as the Mari country is open to the north and north-east, and free access is given into the lands of their neighbours, so long will this tribe carry on their old pursuits, and the consequences will be that chiefs and tribes who have been faithful and helpful to us will suffer.

The best way out of such troubles in the settlement of a difficult question, the most conducive to our consolidation at Quetta and Pishin, will be to bring the routes from the Derajat to Pishin gradually into use, and eventually to occupy the country without interfering with the independence of the people in the matter of their government more than is sufficient to secure peace and order. The process may be made a gradual one, accustoming the tribes of these valleys to intercourse with us, to be witnesses of the evidence of the British power, by conducting columns to and from South Afghanistan as we have already done.

It requires no stretch of imagination to foresee that another bulwark to the Empire would be formed, and a tract of tilled country would replace one of rough barren hills, which give cover to wild and dangerous neighbours.

Appendix I.

NOTE ON THE CITY OF BOST.

By Colonel Henry Yule, C.B., R.E.

Bost or *Bist*.

It is not easy to find anything substantial regarding the history of this city. It is often mentioned indeed, but, so far as the present writer has been able to find, this mention almost always refers to its capture or to the devastation of its territory in war. For it lay on one of the great military tracks,—what may be called an obligatory route for an army,—the most direct from Persia and Herat to India, the most practicable even from those regions to Kabul. Alexander himself, in his advance to Bactria from Northern Khorasan, took the line of the Helmand. The city lay on the eastern frontier of Sijistán (originally Sigistán or Sagastán, now Seistan), in the *Garmsir* or low hot country. The older geographers generally count it as belonging to Sijistán, but sometimes it was reckoned as in Zabulistán or in Ar-Rukháj (*Arachosia*). The land of Bost is also often coupled with, sometimes included in, Zamín-Dávar, which was (and is I think) the name of the region immediately north of it, on the right bank of the Helmand.

There is not, I believe, much doubt that Bost is the subject of Pliny's reference to a city of the *Arachosii*, on the Erymanthus (otherwise *Etymandrus*, the Helmand).[1] The readings are various,—*Parabesten, per Abesten*, &c., but all suggest the name of Best, Bist, or Bost.

Isidore of Charax, in his "Parthian Stations," or Itinerary of the Parthian Empire, supposed to have been written in the first century of our era, mentions, as cities of the territory of *Anauōn* or *Anabōn* of Aria, introduced between *Aria* (Herat) and *Zarangiana* (the country long known as that of Zaranj, immediately adjoining the Lagoon of Seistán), "the very great city of *Phra*, the city of *Bis*, the "city *Gari*, and the city Niē." Mannert has identified the three first of these with *Farrá*, *Bost*, and *Girishk*. The first is hardly questionable, the two others very much so, as the location would be quite erroneous. For beyond *Zarangiana* the author places *Sacastane*, which must be that part of Sijistán which lies on the Lower Helmand, and then "*Arachosia*, or White India," in which is a city called Biyt (*Βιὼτ*). In this last, which is possibly also the Bigis of Ptolemy, we may more safely see a corrupt transcript of *Bist*.

We find a trace of Bost again in the ancient route-map of the Roman Empire, known as the Tables of Peutinger (from Conrad Peutinger, who possessed it), the original compilation of which is ascribed to the latter half of the third century. Here it appears as an important position on the road through *Gedrosia*, or Bilúchistán, to India, a road striking off at this point towards North-Western India (doubtless the road by Ghazni and Kabul). The place itself is termed on the map *Bestia*, with the ambiguous addition *deselutta*, which may be interpreted as a mediæval mistranscription of *destructa* or *desolata*, and will be the first of those commemorations of calamity to which we have alluded. The name, as *Bestigia*, also appears in the work of the (so-styled) "Ravenna Geographer" (*circa* 500), a work which contains a good deal of the same nomenclature as the Peutinger Tables.

Bost is mentioned in the early Mahommedan history as taken by Abdurrahmán, the son of Samra, in the time of Caliph 'Usmán (*circa* 655). It figures again in the wars (*circa* 700) that raged on this frontier with the Hindu King of Kabul in the days of Hajjáj, the great Viceroy of the Caliphate in the East, when another Abdurrahmán, son of Mahommed, was delegated to command in Sijistán, Bost, and Rukhaj.

[1] *Amnis Erymanthus præfluens Parabesten Arachosiorum* (lib. vi, cap. xxiii).

This commander, between whom and Hajjáj there was great personal hostility, had a singular history in which Bost figured, and a tragical end. In 865 we read of the conquest of Bost and Zabulistán by Ya'kúb-bin-Laith, the founder of the brief Saffari dynasty. In 976 the territory of Bost was taken possession of by the Amír Sabuktigín, and some detail, of no great interest on this subject, is given from Khondamír in "Elliot's History" (iv, p. 160). The great son of Sabuktigín, Mahmúd, erected cantonments at Bost, which were extended by his son Masa'úd (*ibid.*, ii, 61). The devastation of this unfortunate border-land in the 11th and 12th centuries, when first the Seljuks and then the Ghúris were attacking the waning dynasty of Mahmúd, is noticed in Elliot's extracts (ii, pp. 274. 380).

Istakhri, the geographer (*c.* 950), calls Bost the greatest city of Sijistán next to Zaranj. In the work translated by Sir W. Ouseley, under the name of "Oriental "Geography," which is chiefly founded on Ibn Haukal (about the same date), the following notice occurs:—The gate of Zaranj, looking towards Bost, seems to have been called *Dar-i-Bosti*, "the Bost Gate." Again we read: "The inhabitants of "Bost are polite and generous, resembling in dress and manners the people of Irák. "It is a city well supplied. . . . . They trade from this city with India" (pp. 203, 206).

This book also gives various itineraries from Bost, as does the geography of Edrisi (translated by Jaubert, vol. i), but the latter gives no particulars regarding the city. Mas'údi, speaking apparently from personal knowledge of the country, says:—"At "this day, in the year 332 (A.D. 943–4) the banks of the Hermand (compare Pliny's "*Erymanthus* above cited) are covered with villages, gardens, and pleasure grounds "belonging to the inhabitants of Sijistán; it is known as the 'River of Bost;' it is "ploughed by boats trafficking from that city to Sijistán, loaded with provisions and "all sorts of merchandize. Sijistán is *par excellence* the country of sands and winds. "It is famous for the industry with which the people utilize the winds in driving "mills, and in raising water to water gardens (on that sandy soil). Perhaps nowhere "in the world do the people turn their circumstances to such good account."[1]

The geographer, Yakút, rendered by Barbier de Meynard in the *Dict. Geogr. de la Perse* (pp. 100 *seqq.*), has several pages regarding Bost, but they are almost entirely occupied with an account of the theologians and other writers born there. Writing about 1220, he says:—"It is well watered and encompassed with gardens, "but it is almost in ruins, and as a man of wit has said" (no doubt the wit consists in a pun upon *Bost* and *bostán*, a garden, though, in fact, that is probably but a recurrence to the etymology of the name), "'tis now but the *garden* of the city "was."

Of later history I have found hardly a word. A note to Ferrier's "Caravan Jour-"neys," probably due to Sir H. Rawlinson, says that the city was only reduced to ruins in the time of Timour (p. 379). The history of Sharíf-ud-dín, as rendered by Petis de la Croix,[2] mentions Timour's marching (1383) from Sijistán against Bost, but fails to say what happened there and then. Probably, however, this was the end of Bost as a city; though a fortress there, on an island in the Helmand, known in later centuries as Kala'-i-Bist (*Bist*, judging from the ancient traces of the name, was probably always the indigenous pronunciation), and guarding the frontier between Khorasan and Kandahar, is often mentioned in the 16th and 17th centuries, *e.g.*, in the wars of Sultan Hussain Mirza of Herat (*c.* 1498), in the recovery of the Afghan provinces by Humayun on his return from Persia (1542), and in the wars of Shah 'Abbás with the Delhi Emperor; it was taken by the former in 1648 and recaptured by the Mogul's troop in 1652–3. The fortress still exists.

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[1] *Prairies d'Or*, ii, 80.

[2] *Hist. de Timur-Bec* (tome i, p. 379).

Appendix II.

DETAIL OF THE CHOTIALI FIELD FORCE.

1st Column.

Major F. J. Keen, 1st Punjab Infantry.
Major G. U. Prior, D.A.Q.M.G.
Captain H. F. Showers, Transport Officer.

1 squadron 8th Bengal Cavalry.
1 „ 2nd Sind Horse.
2 guns Jacobabad Mountain Battery.
2 „ Peshawur „
1st Punjab Native Infantry.

2nd Column.

Colonel R. S. Hill, 1st Ghoorkas.
Major H. H. F. Gifford, 13th Hussars, Brigade Major.

15th Hussars.
32nd Pioneers.
1st Ghoorkas.
2 guns Peshawur Mountain Battery.

With this column the headquarters of the force marched as follows:—

Headquarter Staff.

Major-General Sir M. A. Biddulph, R.A., commanding.
Aide-de-Camp, Lieutenant S. F. Biddulph, 34th Regiment.
Colonel J. Browne, R. E., Political Officer.
Major G. B. Wolseley, 65th Foot, A.A.G.
Captain R. M. Stewart, R.A., A.Q.M.G.
Deputy Surgeon-General J. Hendley, A.M.D., P.M.O.
Captain W. G. Nicholson, R.E., Field Engineer.
Captain W. J. Heaviside, R.E. } Survey Department.
Captain T. H. Howick, R.E. }
Captain W. Luckhardt, Bombay Staff Corps, Principal Commissariat Officer.
Lieutenant W. G. Smith, 70th Foot, Signals.
Lieutenant J. J. Money-Simons, 24th Punjab Native Infantry, Transport.

3rd Column.

Brigadier-General T. Nuthall, Bombay Staff Corps.
Captain W. W. Haywood, 14th Foot, Brigade Major.

2 squadrons 8th Bengal Cavalry.
6 companies 70th Foot.
1 company Sappers.
1 wing 12th Bengal Native Infantry.

Column which proceeded from Dera-Ghazi-Khan to Leghari Barkhan.

Commanding, Colonel Prendergast.
Political Officer, Mr. H. Fryer, Deputy Commissioner, Dera-Ghazi-Khan.

Column.

2½ squadrons 15th Bengal Cavalry.
400 21st Madras Native Infantry.
200 30th „ „
100 Rawalpore Contingent.

This column left Dera-Ghazi-Khan on the 23rd February, and reached Vatakri

on the 6th March. On the 30th, Colonel Prendergast marched, attended by Mr. Fryer, by the Hun Pass, to meet Major Keen and Major Sandeman. The column was threatened, but was not attacked. The march of the 2nd Column on the 2nd to Annumbar effectually checked the intended hostile movement of the tribes.

Death Roll of Officers.

Lieutenant Willis, R.A., Kandahar, assassinated.
Captain Reynolds, 3rd Sind Horse, in action, Kishki Nakhud.
Colonel Fellowes, 32nd Pioneers, dysentery, Hun Pass.
Colonel Nicholetts (subsequently), 2nd Baluchis.

Sir RICHARD TEMPLE, Bart., G.C.S.I., C.I.E.: If no other gentleman is desirous of addressing the meeting, I may as well mention that having been through a portion of the country that Major-General Biddulph has so well described, I can attest from personal observation the entire accuracy of his description. For instance, it is impossible to exaggerate the importance of the situation of Kandahar, at the corner of that great desert. I have seen that desert, and have myself been caught in some of the dust storms which General Biddulph has mentioned. It is that desert which constitutes the great importance of the position of Kandahar. You will perceive by the map that if it were not for that desert, an enemy might take a short cut across from one corner to the other, but in consequence of it he must come round the corner of Kandahar, and that is one of the main reasons why the place must under all circumstances be held. I can also testify to the accuracy of what General Biddulph has said about the Tal-Chotiali Valley, the incursions of the Maris and our relations with the Terin and Kitran tribes; also the correctness of his description of the Khwaja-Amran range, and the importance of the Valley of Pishin, which is now the most advanced portion of the British Empire in that quarter, and which constitutes one of the most important accessions of British territory secured to us by the Treaty of Gandamak. I may further add my testimony to the importance of the line by the Bolan and Quetta, and to the correctness of Major-General Biddulph's description of the desert plain of Kachi, between the southern extremities of the Suliman range and Kelat. The extremely accurate description he gave of the Eastern Suliman range, and his remarks regarding the parallel Western Suliman range, are well worthy of your consideration, and have been brought out by General Biddulph much more clearly than by any other narrative I have yet heard. The extreme importance of the parallel Western Suliman range, upon geographical, political, and strategical considerations, will become more and more manifest the more that question is considered, and I think that General Biddulph has rendered an especial service on this occasion by bringing that point so prominently to your notice. With regard to the country beyond Kandahar, I am not able to give any personal testimony. I may, however, add, with regard to the neighbourhood of Kandahar, that the description which General Biddulph has given of its resources in agricultural and pastoral wealth is perfectly accurate. Those resources are extremely great. The cultivation round Kandahar is of the very best in all Asia. Rich as India is, there is hardly any portion so well cultivated as the country round that city, indeed, I hardly ever saw any land, in any country, which yields so many crops in the year, and in which the irrigation is so perfect. Between the low hills and the plain of Kandahar and the River Argandab the fruit gardens alluded to by Major-General Biddulph are really a sight to behold. There is nothing in all Europe superior to the line of orchards and fruit gardens extending between those rugged trap hills and the rushing water of the Argandab.

Colonel MALCOLM GREEN, C.B.: I should like to ask General Biddulph whether the Mari tribes are of such a formidable nature, that they actually interfere with our communications in Kachi?

General BIDDULPH: I know that the Mari tribe is capable of putting 2,000 horse into the field, and marching perhaps a hundred miles to make an attack. I am not informed whether they have made an attack on the Kachi. I have not

stated that they have; but I am aware that they are enabled to do what I now point out, and they have made such raids over and over again.

Perhaps the audience would like to know how they manage these matters. When they wish to make a descent on a country, the tribe collect their wise men together, and they tell the warriors where the fat country lies, where the cattle and the corn are. When this has been done, they send forward a certain number of spies. These spies afterwards come back and say, It is all right, in such a country there is so much. Then the march is undertaken. They ride upon mares, which make no noise; they travel at night and lie by day. The spies are sent on again, and they give them the most accurate information. They are the most excellent outpost troops in the world. When they arrive close to the scene of action, a perfect watch is kept, and information by spies or by single messengers is secretly sent back. When everything is ready, a terrible rush of horsemen takes place, the villages are surrounded, the cattle are swept away, the women and children are hardly used. It is a very good chance for them, if they escape with their lives. The villagers have their little fortlets to retreat to; and if they reach them they can pull the ladder over and get in, and fire away from their towers, but it goes hard with them if villages are surprised and attacked.

Major-General Sir HENRY GREEN, K.C.S.I., C.B: I should like to ask whether the country of the Maris is so strong as to prevent the possibility of a small British force going in and destroying them, or bringing them to reason in some way?

General BIDDULPH: I should not wish to see them destroyed; they are not at all bad people. If left to themselves and not properly managed, they are likely to come and disturb my friends the Kakurs, and as the latter led me through the country very well, I should be sorry to see them injured.

Sir HENRY GREEN: How would you deal with the Maris?

General BIDDULPH: By placing a small force on their flank, just as if I met an uncomfortable character in the street; I should put some one on each side of him.

Sir HENRY GREEN: In my march through the country in 1859, I did not find much difficulty with them.

General BIDDULPH: As long as you are there in force, you can do very well; but directly you leave them to their own machinations, difficulties will arise. They require to be kept in order.

Sir HENRY GREEN: These men in the plain are not formidable?

General BIDDULPH: Oh, no.

Sir HENRY GREEN: Sir William Merewether, of the Scinde Horse, in 1847, met 700 Bugtis, and killed 620.

General BIDDULPH: Such might well happen in the plains, but when you get into the neighbourhood of the mountains, there would be trouble and loss taking place. I lost one great friend of mine through a neighbouring tribe, the Dumars, still troublesome. The way to be strong is to hold them in check, and to have your forts and your little posts until they gradually get accustomed to white faces, and then by degrees we might expect them to settle down.[1]

Mr. FRYER, Assistant-Commissioner Dera-Ghazi-Khan: I have known the Maris a good many years, and I have always found them perfectly easy to deal with. All that they require is that they should be kept in check, and not too much favoured.

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[1] "The country of the Maris is the strip of mountains lying between the Derajat "and the neighbourhood of the Bolan. On the north it touches the valleys of Tal- "Chotiali, and the country of the Lunis and the Plain Barkhan. As the Maris "are prevented from raiding on the Kachi or Derajat, they will carry out enter- "prises against their northern neighbours. My view is, that the Maris may be kept "in check by suitable points being held and by giving service, not to such an extent "as to spoil them, but so as to render them useful as police on communications. "It is of the highest importance to prevent the oppression of the Legaris, Kitrans, "and other tribes who have been and can still be useful to us, and it is high time "to gradually bring the Dumars, Maris, and other turbulent races to respect order "and tranquillity."—M. A. B.

In case of a force being sent against them, there would be no difficulty in mastering them at any time, provided you could catch them, but they have no settled home. They certainly have one large walled village, but they seldom reside there; they are generally out with their flocks. They have very few crops, so that in case of a force being sent against them, it would find nothing tangible, and the Maris would immediately retreat into the hills, and should the troops follow them, they would always find refuge amongst their neighbours. In the case of the Bugtis, when Sir Charles Napier went against them, the great majority of the tribe took refuge with the Kitrans, and they remained there until our forces were withdrawn, when they returned. The Maris would do the same. All the surrounding tribes are afraid of them, and would not be bold enough to refuse them hospitality. I am sure that on all occasions, when the Maris have been made to understand that it was their interest to help us, they have done so. As Major-General Biddulph has stated, they gave us guides when we were passing through their country, they assisted the convoys, and they did everything we asked them to do. As long as they show a disposition to be friendly and do what we want, there is no occasion to take any hostile measures against them.

Colonel DEANE: I should like to ask if Major-General Biddulph can give us any information with regard to the railway that is proposed from the Indus to Kandahar; whether it was commenced before he left the country; and, if so, whether he has any personal knowledge of its construction?

General BIDDULPH: The railway was commenced after I left India; the following notes on it may be interesting. You will see from the map that we have rail communication with Kotree, but at Sukkur, as the line takes the left or eastern bank, it is quite useless as a communication in a direction towards Kandahar from any point higher up the Indus. Hence it was wisely determined to make a line from Sukkur without waiting for further development of the railway system. For a long time it was considered that it would be a difficult operation to make a railway from Sukkur to Dadur, on account of the local floods and other circumstances; however, by the energy of the authorities, particularly of Sir Richard Temple, on the 1st of October the first plate was laid, and 136 miles were completed in 131 days, to Sibi. Now that is a marvellous feat, which should be thoroughly recognised. From Sibi, elevation 750 feet, the rail has to mount a ramp to a plateau of 5,300 or 5,400 feet. This, I must say, will be a very serious difficulty. However, it is hoped that by taking a semi-circular course, and leading along the sinuosities of the hills, they may be able to conduct the line to the Pishin plateau, entering it about Gwal, by easy gradients. This work will prove to be the one great outcome of the war, for there is nothing that will so tend to civilization and the introduction of a proper state of order as a good road. The course of the railway will be from Sibi up the Nari River, and the point of exit from the hills will be at the Suggurbund defile exactly opposite Gwal, and it would thus reach the open valley and the plain of Pishin, without crossing any obstructing limb or watercourse of any importance until the Khoja Amran is arrived at. It is probable that it would cross this range by the Gwaja Pass. The ascent will be easy, but the descent will be as steep as that of the Bhore Ghaut, near Bombay, which I believe is 1 in 37. After the Khoja Amran is passed, there is no obstruction of any serious kind till the rivers Arghessan and Turnak. These rivers are serious difficulties, but I think any engineer might suggest to you how they might be overcome. I fancy it will be by trestle work of iron. There is, I repeat, actually no very serious obstacle but this Khoja Amran, after leaving the mountains on the east border of the Pishin Valley. The great difficulty and expense will lie between Sibi and Gwal. When the line reaches the plain of Kandahar—and I have no doubt it will be reached—there is no obstruction the whole way to Girishk, except at the Argandab River. I will only say, in conclusion, that I hope everyone in power will do his best to push on the railway, which will do more towards a settlement of Afghan difficulties than any other enterprise.

The CHAIRMAN: I do not venture to make any general remarks on this subject, as I have had no personal experience in India, but I will simply say that to-day one point has not been mentioned with regard to the value of Kandahar, namely, that it is not only a great commercial town and halting-place of caravans between

Herat and Persia and India, by the Bolan Pass, but that it is also on the main road to India by the Khyber, and is the point where the roads branch off to the two passes: this makes it doubly valuable—a value which would not be possessed by retaining Pishin only. I merely wish to point out this fact, as it has not been alluded to. We have now nothing further to do than to return our best thanks to Major-General Sir Michael Biddulph for the interesting lecture that he has given us.

H.R.H. THE DUKE OF CAMBRIDGE: I rise to second the motion. I regret that I was prevented from being earlier present on this occasion. I was compelled (as perhaps may be known to those present) to be in another place; but, finding there was time to come here, I was anxious to show by my presence—however late I might be—that I was desirous of attending this lecture, and that inability alone prevented my taking the chair. From what little I heard, I feel satisfied that the lecture was a very interesting and valuable one. As to the observations that have fallen from various gentlemen, as well as from Major-General Biddulph himself, on the political question, of course it would not be for me to say anything. I will only say that it is very essential to the interests of this Empire that these questions should be fully and fairly discussed and ventilated. The more that is known about them, the better it is for all parties concerned. Whilst we are anxious to do what is of great importance to ourselves, we are of course at the same time anxious to avoid doing anything which is unjust to others. In reference to these great subjects that are brought before us, we ought to hear all the *pros* and *cons* without favour or affection either towards ourselves or others. That is the only remark I will venture to make, because I feel that in my position it would be improper for me to express any opinion either one way or the other as to the advantage or disadvantage of holding this or that point on a great line which we have now occupied by the valour of our troops and by the excellence of our Generals. I should like to take this opportunity of saying that it is a matter of great congratulation to the country, that in all these operations that we have conducted, the Native Army of India has played a very conspicuous part, and that it has done so in a manner most creditable to itself and most valuable to the interests of the country; and I think that every opportunity should be taken of letting that be generally felt, as well at home as in India itself. I believe that the more we appreciate the value of those excellent troops, the more they will be devoted to our service, and the more they will add to the power and influence of our country. Allow me to repeat that I regret very much that I was not here at the earlier stage of these proceedings; but I cordially second the vote of thanks to Sir Michael Biddulph for his valuable and interesting lecture.

A STREAK OF THE AFGHAN WAR.—LIEUTENANT-GENERAL SIR DONALD STEWART'S MARCH FROM KANDAHAR TO GHAZNI, WITH ACTIONS OF AHMED KHEL AND URZU.

By Captain R. Elias, 59th Regiment.

In the spring of this year, when the snow had disappeared from the roads and plains between Kandahar and Ghazni, it was decided that the time had arrived to make the long-talked-of advance on the latter place, in order to convince the Afghans of the *fortiter in re* that lies hidden behind our *suaviter in modo* principles of warfare, and to give them unmistakable proof that, although our skirmishing line is in a great measure composed of silver, we possess reliable supports and reserves of lead and steel in the background.

The Ghazni Field Force was composed as follows:—

Lieutenant-General Sir Donald Stewart, K.C.B., Commanding.

1st Infantry Brigade, Brigadier-General Barter, C.B., Commanding: 60th Rifles, 15th Sikhs, 25th Punjab N.I.

2nd Infantry Brigade, Brigadier-General Hughes Commanding: 59th Regiment, 3rd Goorkhas, 2nd Sikhs.

Cavalry Brigade, Brigadier-General Palliser, C.B., Commanding: 1st Punjab Cavalry (with 1st Brigade), 2nd Punjab Cavalry (with 2nd Brigade), 19th Bengal Lancers (with Headquarters), 19th Punjab N.I. (with Headquarters).

Artillery, Colonel Johnson, R.H.A., Commanding: A | B R.H.A. (with Headquarters), G | 4 R.A. (with 2nd Brigade), 6 | 11 R.A. Heavy Battery (with 2nd Brigade), 11 | 11 R.A. Mountain Battery (with 1st Brigade), No. 4 Company Sappers and Miners, No. 10 Company Sappers and Miners.

Engineer Field Park, Ordnance Department, Transport Department, Survey Department, Commissariat Department, Section A, Section B, Field Hospital.

Total number of fighting men (including artillerymen) in round numbers, 7,000.

The 1st Brigade left Kandahar on the 29th March, moving by the left bank of the Turnak. On the right bank marched General Stewart with Headquarters who left Kandahar on the 30th March, and the 2nd Brigade which left Kandahar on the 31st March. On the 6th and 7th April Headquarters and the 2nd Brigade, respectively, reached Kalat-i-Ghilzai, and were joined by 2 companies 59th Regiment, 2 guns G | 4 R.A., and 2 guns 11 | 11 Mountain Battery, these troops having been on detachment there during the winter. A halt of two days was made, and some additional supplies and transport animals taken on. The latter consisted chiefly of camels, and considerable difficulty was experienced in obtaining a sufficient number for our force.

Fortunately the season and weather were favourable, and we lost comparatively few. To give an idea, here is a statement of the total number of transport animals belonging to the 2nd Brigade on the 24th April, viz., 1,597 camels, 786 mules, 114 ponies, 460 donkeys, 120 bullocks. The total number of camels at starting was 1,804; there had therefore been a loss of 207 camels—a loss of 11·47 per cent. The losses among the other animals were as small as to be scarcely worth mentioning—one mule, two ponies, &c., once more showing the miserable inferiority of camel transport.

On the 8th and 9th April, the march was continued from Kalat-i-Ghilzai. To give a detailed account of each day's stage would be tedious and uninteresting. The halting places on the right bank were nearly all the same as those encamped at by Keane's force in 1838, and described in the narrative of Major Hough, Deputy Judge Advocate with that force. They are as follows:—From Kandahar to Moman—Robat—Khel-i-Akhund—Shahr-i-Safr—Tirandaz—Jeldak—Pul-i-Sang—Kalat-i-Ghilzai—Sar-i-Asp—Naurak—Tazi—Shahjui—Chashma-i-Panjak—Ghojan—Mukar—Karez-i-Oba—Jamrud—Mashaki—Ahmed Khel—Nani to Ghazni (two marches). Total distance about 230 miles. These were the halting places of the Headquarters and 2nd Brigade. The 1st Brigade followed a parallel line on the other side of the river until reaching Jamrud, where the whole division concentrated and afterwards moved on together.

In travelling northward from Kandahar a considerable change is noticeable in the character of climate, country, and people all along the road. The hills look as bare and as barren as ever; but the strip of valley, sometimes narrow enough, sometimes opening out to a generous breadth on each side of the river, becomes gradually more and more fertile, better cultivated, and more thickly populated as the neighbourhood of Ghazni is reached. The people are finer and they all understand Persian, which was to a certain extent an advantage; the state of the case on our side being that hardly any of us know Pushtoo, a few know Persian, and most of us are innocent of any knowledge of either. The villages are larger and better built—still of mud—but the cottages and forts are better finished, so that at a little distance the latter especially look as if they were of stone. The number of forts is surprising; each village, and they are often only a few hundred yards apart, has its fort, sometimes two, and one cannot help being forcibly reminded of the likeness to the state of things existing not so very long ago on the English and Scottish border as portrayed in the "Lay of the Last Minstrel" and other works of Scott. It is noteworthy however that notwithstanding their frequent feuds and fights very few maimed individuals are seen about, from which it would appear that either the fights are not so frequent and serious as they are said to be, or that short work is made with the wounded. At the present time of year the crops are coming on and all looks peaceable enough in and around the villages, and we have remarked with satisfaction the absence of the privateering Ghazi,[1] so unpleasantly com-

[1] Literally, "hero," or "warrior;" but with us the word has come to signify a Mussulman fanatic.

mon in Kandahar. Foraging parties have once or twice been fired at, and on the morning of the 16th April, soon after leaving our camping ground at Mukar, Lieutenant Elverson, Transport Officer 2nd Brigade, who was coming up in rear of the column with some animals loaded with grain, escorted by a party of Goorkhas and 2nd Punjab Cavalry, had halted by the margin of a peacefully rippling brook, when all of a sudden a very lively and continuous, but badly aimed fire was opened on the party from some caves in the side of a neighbouring hill on the left of the road; as it was impossible to reply to it or to attack the natives in their hill, the only plan was to move on with as much dignity as might be, inclining perhaps a trifle to the right. Strange to say no one was hit, but a bullet found its billet in one of Mr. Elverson's saddle bags. Three incautious Afghans, having ventured on to the road with arms in their hands, were made prisoners and brought into camp. On the same day large bodies of the enemy were seen by the cavalry scouts on the right. For some days the dust had been seen of a large body of troops moving about 15 miles off, on our right, and parallel to our line of march—exactly as they did in 1838—and it was pretty well known that they had been marching up all the way from near Kandahar, increasing their strength on the way, with the intention of opposing our advance when a convenient time and place should be found.

On the 17th April, the whole division concentrated at Jamrud. In this part of the country the valley is broad and thickly populated, and many of the villages are inhabited by our allies. the Hazaras; these, taking advantage of our presence, and of the fact that nearly all the Afghan villages along the line had been deserted, looted everything that was left, and set fire to the buildings. On the whole these friends were of little service to us, rather the reverse. Much grain and bhoosa,[1] which would have fallen into our hands, and of which we were much in need, was appropriated by them. In physique they are inferior to the Afghans. They have the Mongol cast of countenance and but little hair on their faces. When (or if) we leave the country their fate, it is to be feared, will not be an enviable one. On the march to Jamrud a small party of the enemy, chiefly cavalry, hung about our rear and right flank, keeping however at a respectful distance.

On the 18th, we advanced to Mashaki by a sandy road, broken by nullas and watercourses. The Hazaras kept very close to us, and on each side of the road were seen many Afghan villages burning. The Hazaras had set them on fire. In the afternoon, after arriving in camp, a reconnoitring party went out, was fired at, and reported the enemy in force about 3 miles ahead in the direction of our intended march next day.

The morning of the 19th April was close and sultry. We marched at 4·30, expecting that now at last we should meet the enemy, and we were not disappointed. The line of march was over a broad plain, rough and stony, and crossed at about 3 miles beyond Mashaki by a line of low sandy hills, where the Afghans had been seen the evening

[1] Chopped straw.

before. This line was passed without opposition and without even seeing an Afghan; but when we had advanced about 6 miles further, to just about the spot where we had intended to encamp, the crests of another and higher range of hills in our front and to the left of our road were seen to be covered with a large Afghan force of horse and foot. Very quiet and determined they looked on the tops of their hills, and it was impossible to tell how many more might be on the reverse slopes in rear of those we could see. Their main body, chiefly composed of men on foot, was on a hill to our left front, and a large party, many of which were horsemen, was moving slowly round the crests to a position rather lower down and directly on the left of our advance. These looked so uncommonly near that many were asking if they really were the enemy, and whether they might not be Hazaras. Standards, red, green, and white, were being carried about, others were planted in the ground. Some saw the mullahs blessing the weapons of the Ghazis before sending them down to fight. Two batteries, A | B R.H.A. and G | 4 R.A. were soon in position, the former on a hillock to the left of the road, the latter on rather lower ground to the left of and rather in front of A | B. A steady and effective fire was immediately opened on the main gathering of the enemy, first shot fired at 9 A.M. The infantry now came up and formed for attack on the left of the batteries, 59th on the left of G | 4, line continued to the left by the 2nd Sikhs, then the 3rd Goorkhas, 19th Punjab N.I. in reserve. In forming up, a gap was left between G | 4 and the right of the infantry line; this was filled by one company 60th Rifles and one company 25th Punjab N.I., both part of the Lieutenant-General's escort. Two squadrons 2nd Punjab Cavalry were on the right rear of A | B R.H.A., and of the other squadron one troop, as escort, was on the right flank, and one on the left of the two batteries. The main body of the 19th Bengal Lancers formed up in front of the rear of the left of the infantry line. Two troops had been sent forward to reconnoitre the enemy's right. 6 | 11 Heavy Battery halted about 1,000 yards in rear of the line and opposite the enemy's right. The field hospital was established in rear of the left; more to the centre was a hill, where the Lieutenant-General and Headquarter Staff took post. Intrenching tools were sent back, baggage halted in rear. 1st Brigade about 3 miles in rear.

Such, as nearly as may be, was the position when the action of Ahmed Khel was begun. The Afghans were in a well-chosen position, and if they had been wise they would have remained in it, and let us attack them after a hard pull up a steep hill; but almost before the infantry line was formed, they began to come down on us on all sides. In the centre, crowds of Ghazis on foot came swarming over the crest and down the side of the high hill opposite the infantry and artillery; the latter continued firing and the infantry now also opened fire all along the line, but not a whit did the Ghazis waver. Very curious was the appearance they presented as they came in a steady crowd, striding down the hill fast enough, but not appearing to rush, their legs very wide apart (as I suppose they must be, running down a steep hill), most of them big men, with long white robes flowing in the wind,

right arms with swords and other weapons extended, and trying to guard their heads (against Martini-Henry bullets!) with shields. Anyone with the semblance of a heart under his khaki[1] jacket could not help feeling something like pity to see them thus advancing with their miserable weapons in the face of our guns and rifles; but their courage and numbers made them formidable. As they came on, at about 600 yards, the effect of our fire began to be seen in earnest, and at 300 and 400 yards the slaughter was terrific—as the smoke rolled away the ground in front was seen to be simply strewed with prostrate Ghazis. Still they advanced with courage amounting to madness. Now supports and reserves were all in the fighting line, which was certainly rather too crowded, and the batteries, A | B and G | 4, began to fire case, and a little later inverted shrapnel. While this was going on in the centre, the enemy on the right and left had also advanced. On the right they came in masses of cavalry and infantry, making the most determined attempts to get round and attack us in rear; it was here that the 2nd Punjab Cavalry did good service by making repeated charges by troops, thus checking the advance; but they came in such numbers that it was impossible to drive them all back at once. On the left a similar turning movement was being attempted; here a party of the 19th Bengal Lancers, moving at a trot, came upon a large body of Ghazi cavalry, galloping round the spur of a hill. This happened so unexpectedly that the Lancers were irresistibly and unavoidably thrown back, and both parties, fighting hand to hand, came galloping in past the left of and through the Goorkhas, who formed company and rallying squares, and creating no small confusion in the 19th Punjab N.I., the field hospital, and among the occupants of the Lieutenant-General's hill; but the Ghazis, already without order or cohesion, were by the Lancers, the fire of the Goorkhas, the 19th Punjab N.I., and of other corps near, who could bring any fire to bear upon them, dispersed and driven beyond our line. These three attacks were made almost simultaneously, that on the left began a little later than the others. A party of the enemy also, some cavalry, some on foot, had made a move down the lower hill on our left rear and opposite to where 6 | 11 R.A. had halted. They appeared to be meditating an attack on the baggage, but Major Tillard landed a few shells from the 40-pounders among them, when any design they may have had on the baggage was speedily abandoned, and they were seen no more. And now came the critical moment, the turning point of the day. For three-quarters of an hour the Ghazis had been continually swarming on, right up to the muzzles of the guns and rifles. As soon as a knot of six or seven had been swept away by case-shot, as frequently happened, or mown down by the fire of the Martini-Henrys, their places were at once filled by others; their numbers seemed endless, and on the right, considerable bodies were actually inside our line. For this reason it was necessary to throw back that flank. The two batteries, the two escort companies (of 60th Rifles and 25th Punjab N.I.) and the 59th Regiment all retired (for about 200 yards on the extreme

[1] Khaki = thin brown stuff, something like brown holland.

right, towards the centre somewhat less). Firing was kept up on the enemy already in and trying to get into the line, and they were thus kept on the right side of our guns and rifles. As soon as this was the case, the guns again came into action, two guns, G | 4, going to the right and four to the left; the infantry halted, fronted, and again opened fire nearly in the original direction. The line at this time was in shape very nearly the arc of a circle. After a few minutes more firing, it was plain that the rush of the Ghazis was broken. Crowds continued to come on, but not with the same vigour as before; then many were seen edging off to the right and left, some deliberately retreating. The entire attack seemed to open out and give way, the military atmosphere was clearing; a few minutes later the whole were in full retreat and the day was ours. The fighting had lasted a little more than an hour; most of the fugitives moved off in the direction of the river and the Shilghur Hills beyond, *i.e.*, eastward; but a large body collected on a hill more to the north, nearly a mile from us. As it was not quite certain whether they might not gather again, a general advance was made to some rising ground about 500 yards in front, but they had had enough: after a few well-directed shells, those on the hills also dispersed. The greater part of the cavalry, joined by the 1st Punjab Cavalry, which had just come up in time from the 1st Brigade, pursued the fugitives for about 3 miles; our horsemen were then recalled. They killed many, but if they had been allowed to go on, hundreds more would have been accounted for. A halt of about an hour's duration was made on the ground, and all were glad of a rest. During this time it was necessary to keep a sharp eye on the enemy's wounded and apparently dead, in order to guard against such mischances as the following:—A soldier of the 59th Regiment walked up to an Afghan, wounded and lying on the ground; suddenly a sword, sharp as a razor, flashed from under the folds of the prostrate man's dress and inflicted such a terrible wound just below the man's knee that his leg has since had to be amputated. There were several cases of wounded men doing their utmost to injure anyone who approached them; fortunately they were not generally successful.

It is difficult to estimate at all accurately the numbers of the enemy, but altogether there must have been from 12,000 to 15,000, but many of these never came down from the hills. The real attack, the rush of Ghazis, was made by 3,000 or 4,000, of whom about 600 were mounted. Their loss must have been about 2,000 killed and wounded, probably more. Our numbers actually fighting were approximately 1,800 infantry, 700 cavalry (not including the 1st Punjab Cavalry, which joined afterwards), 12 Horse Artillery and field guns, and the heavy battery, consisting of 2 40-pounders and 2 6·3-in. howitzers. Our loss, 17 killed, 126 wounded. Most of the Afghans were armed with swords and shields; there were among them a few Snider rifles. Some had bayonets on sticks, and about one-third was fitted out with matchlocks and flint and steel implements, with short thin stocks, very much bent, and generally inlaid with ivory, such as may be seen on the walls of any old armoury at home, where they repose in the character of antique curiosities. When fire is applied to the touch-

hole or the trigger is pulled, they sometimes go off, sometimes they do not. The Hazaras, to the number of about 2,000, remained spectators of the fight, but they did not join in it; they joined however in the pursuit. During the hottest part of the fight, just when the right was being thrown back, a colour-sergeant of the 60th Rifles, at some distance in front of the line, was wounded and unable to move. Dozens of Ghazis were making for the spot to despatch him, when Second Lieutenant Twynam, 59th Regiment, gallantly ran out to his assistance; he got close up to him, was cut at by a Ghazi, parried the cut, and ran another Ghazi through the body; but the soldier was hacked to pieces in a minute, and Mr. Twynam only just got back to the line in time to save himself from a similar fate. A like bold attempt was made by Major Frampton, 59th Regiment, in the case of another wounded soldier; but it was impossible to rescue any one who was down—the Ghazis immediately swarmed round him like hounds breaking into a fox.

The Afghan commanders were Shir Jan, Taraki, and Mahomed Aslam Khan, Tokhi. It is said that a son of Mushki Alam was present at the action. The chief tribes concerned in it were Tarakis, Tokhis, and Suleiman Khels.

At midday the whole division, now together, commenced a general advance in line of columns over very rough ground. No more was seen of the enemy, except those unfortunates who had not been able to get far away from the field. The advance was continued to Nani, a village about 7 miles beyond Ahmed Khel, where we encamped for the night. Soon after pitching the tents a party of armed men, apparently Afghans, was seen approaching the camp. The alarm was sounded. All turned out, when, lo! it was no enemy, but some of our old friends, the Hazaras, again. With many smiles and salaams they came in, and reposed for the night in the neighbourhood of the 59th guard tent. The whole force broke up from Nani early next morning and marched towards Ghazni, the road leading through a broad fertile valley, covered with fine orchards and fortified villages. We encamped on a plain 6 miles short of Ghazni, the fortress being visible under the hills in the distance. A strong party of cavalry was sent on and found the place undefended. On the 21st, we marched to Ghazni and encamped just outside. But few people showed themselves, the shops (such as they are) were shut, and supplies were scarce. Ghazni is not an imposing-looking place. It is well placed in the country to form a rallying point for malcontents and other gatherings, but it lies at the foot of the hills, is commanded by the neighbouring heights, and from a fortification point of view is not specially formidable. A large quantity of powder was found there, also a battery of 6 small brass guns, made at Sherpur, and 4 guns of larger calibre. Two of the latter were brought away, the remainder left there.

On the 22nd it was reported that a large body of the enemy were gathered in the villages of Urzu and Shalez, 7 miles south-west of Ghazni. It was determined to attack them next day. Moved out from the camp, therefore, under the command of Brigadier-General Palliser, C.B., at 3 A.M., on the morning of the 23rd, the whole of the

1st Brigade, reinforced by the 2nd Sikhs and 2nd Punjab Cavalry, with A | B R.H.A., and 11 | 11 Mountain Battery, and 1st Punjab Cavalry. Followed in reserve an hour later under Brigadier-General Hughes, the 59th Regiment, 3rd Goorkhas, 4 companies 19th Punjab N.I., G | 4 R.A., and 19th Bengal Lancers. All carried with them one day's cooked rations. Remained for protection of camp 6 | 11 Heavy Battery, and piquets and guards of all corps. The reserve moved about one mile out of camp and halted so as to be ready in case of need, while the troops under General Palliser marched on to attack and surprise the villages. The advance was over stony and uneven ground, and a ridge of hills immediately in front hid the villages from view until within two miles of them. On reaching the crest of this ridge, General Palliser saw that the surprise was complete enough, and great was the excitement and loud the inspiring tones of the tom-toms when our early visit and its nature became apparent. The early bird is pretty sure of its Afghan worm, as the latter never has any piquets out. It was also seen, however, that the mud walls were very thick, that a large force was gathered within, and the ground just in front of them looked from our position, low, broken, marshy, and uninviting to advance over. The two villages were nearly half a mile apart; there was a great deal of cultivation around but no large trees, so that the villages stood very clearly exposed to view from the ridge of hills above mentioned. The guns were at once pushed forward and began to shell the places, but the occupants declined to be dislodged. The bombardment was kept up for an hour, but the outer walls and those of the houses were so thick that the light 9-pounder shells had but little effect. *J'y suis, et j'y reste* seemed to be the policy determined on, and was being very obstinately carried out. An advance of cavalry and infantry was productive of little result, and it became clear that with the numbers at General Palliser's disposal, nothing short of storming the places would drive the enemy out. Such a proceeding, although pretty certain of success, must inevitably have cost many lives, a sacrifice which the occasion did not demand, and which our small force could ill afford. A message was therefore sent back to the Lieutenant-General (with the reserve) explaining the state of things, and the 3rd Goorkhas, and a half battalion 59th were sent forward as a reinforcement. These were soon afterwards followed (9.30 A.M.) by the Lieutenant-General and the whole of the troops in reserve. By the time the 2nd Brigade (*i.e.*, reserve) had reached the ridge of hills, the enemy had received some reinforcements from neighbouring villages, and many, some cavalry, but mostly infantry, were now outside in rear of the open space between the two villages, but well out of range. Twice they formed up, and made a feint to advance, but were careful not to commit themselves to any rash action; they behaved very differently to the Ghazis at Ahmed Khel. At 11 A.M., an advance was made by a long line formed of the combined brigades. The artillery at once commenced shelling the villages, and the party opposite the interval; the latter, still in no way rash, retiring slowly as soon as our advance began. The infantry opened fire as soon as they got within range. There was not much to fire at, for the occu-

pants of the villages kept as much as possible out of sight, and their friends in the field out of range—a feeble and ineffective reply to our fire was kept up, and the enemy appeared to have two guns,[1] which were heard but not seen. Steadily advancing, our long line reached the walls of the village, our flanks overlapped, and began to turn them; then, fearful of being surrounded, and caught in a trap, all the Afghans rushed out and made off over the country in full retreat. At this time many were killed—their loss is said to have been about 400; ours, two men killed, and three or four wounded. The cavalry pursued for a short distance. Foraging parties were sent into the villages, and secured a few bags of flour, and some sheep and bullocks. At 3 P.M., the troops marched back to camp, arriving when the shades of night were falling, after a hard day's work (more than twelve hours); hard on account of the heat, the dust, the rough ground. The fighting was insignificant. We had left our camp 7 miles behind, not very strongly protected. What if the whole affair had been a ruse to inveigle us out, while a large force came down from the hills in our absence and burned all the tents, stores, &c., but the Afghans are not an enterprising enemy, and there was probably nothing to fear! Those in camp had, in case of accidents, thrown up shelter trenches, and other hasty defences,—some very good breastworks made with camel saddles.

On the 25th April, the force broke up from Ghazni marching by the well-known Shir Daban (Lion's Mouth) Pass northwards towards Kabul. No enemy has been met with since.

The Ghazni Field Force, as such, is now dissolved, and most of its component parts find themselves summering in the Logar Valley.

I have put Afghan "War" at the head of this narrative. Let it stand. "Armed political intervention" would have been more exact. It may be much wiser to proceed according to the latter method; but it is not war in the old sense of the word, certainly not war as the Afghans understand it. We do not inspire them with the terror of our arms and name; even when we beat them in the field, they are ready to fight again in a few months, or in some other part of the country. We do not devastate nor destroy—do not even take the supplies we require without paying an exorbitant price for them. To all the inhabitants for miles away from our forces, our occupation has been an unmixed blessing. To "scatter plenty o'er a smiling land" is doubtless very noble, but it is not exactly war. Except in the case of the mother and wife of Yakub Khan, we have never interfered in any way with the women or families of the natives. If, instead of two, 200 princesses or ladies of the best families had been similarly expatriated for a time, it would probably have had a considerable effect in bringing the chiefs to reason. We are too civilized to make war with such people.

If it should be decided to annex the country—as soon as such a decision became known as certain—we should have many adherents among the people. Hazaras, Kizilbashes, possibly Tajiks, all the more

[1] Probably large jezails.

orderly tribes; especially when all understood that the practice of their own religion would not be interfered with. Many now think that if we took over the country we should force our religion upon them, just as they would do themselves in a similar case; and of course the mullahs,[1] when stirring them up against us, do not omit to foster and promulgate ideas and notions so well calculated to aid their purpose.

But I will sternly cut the thread of this discourse, as it is gradually getting beyond the sphere of a regimental Officer.

[1] Priests.

Friday, July 2, 1880.

LIEUTENANT-GENERAL C. P. BEAUCHAMP WALKER, C.B., &c., &c., Vice-Chairman of the Council, in the Chair.

INTRENCHING TOOLS.

By Lieutenant-Colonel G. UPTON PRIOR, 100th Regiment.

IN discussing the subject of intrenching tools this afternoon, I would avoid the general question of their necessity to an army, and how they should be carried, whether on the soldier himself, or as baggage on carts, mules, &c., because these questions have already been most carefully gone into in the Prize and other Essays on "Field In-"trenching; its Application on the Battle Field and its Bearing on "Tactics," and the numerous instances quoted therein of the use of intrenching tools, notably the case of Plevna, would make anything I could say on the subject superfluous. We have also before us the fact that many Continental Powers, who have had experience in *European* fighting, make their soldiers carry intrenching tools. I would then, as far as these remarks are concerned, accept it as a fact that a soldier should carry them himself.

The only intrenching tool of this nature up to the present is, as far as I know, the Roumanian shovel. Before its introduction, the intrenching tools of an army consisted of full-sized picks and shovels, carried with the baggage or obtained from the country, and issued to the soldier when required.

The subject of our discussion then is rather limited; "a spade is a "spade," as the old saying goes, and you can't make more of it, unless you introduce something new altogether. This must be my apology then for speaking this afternoon solely on the principles I am inclined to think should regulate the intrenching tool of the future, illustrating my meaning by showing you some sets of tools patented on those principles, and I trust to the discussion which I hope may follow, to show whether those principles are sound or not.

My remarks will be confined then to considering—

1. What should be the construction of an intrenching tool to be carried by a soldier in the ranks, viz., is it to be in pieces, or not, how heavy is it to be, &c.?

2. The sort of tools these should be, viz., spades, axes, picks, hoes, &c., or what?

3. The number of such tools a battalion should always have with it?

As regards the first heading, "the construction of an intrenching "tool," what are the main points we wish to obtain in any tool that has

to be carried by a soldier in the ranks? I think these may be summed up in two, which we may call serviceability and portability.

Serviceability is, of course, indispensable, as no tool can be useful, however portable it is, unless it is serviceable, but still it must yield to portability to a certain extent. Thus we could not find anything illustrate serviceability better than the ordinary tools of everyday life; taking a spade for example, nothing could give us a better standard of excellence than the ordinary one; the experience of hundreds of years proves it to be the best tool for its purpose.

Now, if we analyze it, we find it has a blade measuring about 9 inches by 12 inches, a handle $2\frac{1}{2}$ feet long, not including the length of the blade, and a total weight of 7 or 8 lbs. Why cannot we adopt it *in toto* for our military spade? Because it does not fulfil the second condition of portability. How could a soldier carry an ordinary spade in his hand? It would inconvenience him greatly in a long march, when skirmishing, lying down, kneeling, or getting through hedges, &c.; and if he had to dig half lying down, as he might have to do, under fire, the length of the handle and size generally would make it a difficult matter. And the same may be said of any other tool; its serviceability must to a certain extent be sacrificed to portability. But the bigger tool we can get, the nearer we shall approach to our standard of excellence, the tool of ordinary everyday use, in the size of its blade, the length of its handle, and its total weight. It is in this last particular, weight, that any intrenching tool must differ so much from an ordinary tool as it is limited by what a soldier can carry. This weight is fixed in foreign armies in the case of the Roumanian shovel, at, I believe, about $1\frac{1}{2}$ or $1\frac{3}{4}$ lbs.; and when we consider the number of things a soldier has to carry on the march, his rifle, bayonet, ammunition, valise, great coat, water-bottle, with perhaps a blanket and a day's food, &c., $1\frac{1}{2}$ or 2 lbs. extra weight in the shape of intrenching tools is certainly as much as he can be expected to carry. We may say then that the weight that can be expended in intrenching tools should not exceed 2 lbs. How can we best utilize this weight to obtain a tool as like our standard as possible? The answer seems to be to have a tool you can carry in pieces, each piece weighing the full limit of 2 lbs. Thus when you put these pieces together, you get a whole more approaching your standard than any tool in one piece of a total weight of 2 lbs. can. Such a tool must be very small: thus the Roumanian shovel, which is in one piece, is a good example of what can be done with this weight. It has a blade of 8 inches by 6 inches, with a handle 12 inches long, and I do not see how you could get a better tool at the weight. Our first point then, serviceability, seems to require that the intrenching tool should be made in pieces in order to obtain a tool of even moderate size.

We will now turn to the second point, portability. Evidently, weights being equal, the smaller a thing is, the easier it is to carry, generally speaking. Thus taking a homely simile, it would be much easier to carry a pound of lead than a pound of feathers, the lead occupying so much less room. Applying the principle to the intrenching tool, it is much easier for a soldier to carry 2 lbs. in a blade by

itself, or a handle by itself, than to carry the 2 lbs. in one article made up of a blade and a handle together. Our second point then, portability, seems also to require that the intrenching tool should be made in pieces. The question now comes, in how many pieces shall it be? and the answer seemingly is, in two pieces, because you cannot well divide your blade in two, and if that is not to exceed 2 lbs., it is no use having a handle much heavier, as it would be out of proportion, whilst a weight of 2 lbs. would give a very fair handle. There are also certain objections to carrying a tool in pieces, which make it advisable to restrict the number. It would never do to have them so scattered about a battalion, that you could not get them together when required; in fact, it is absolutely necessary to ensure being able to do this; and the greater number of pieces there are, the more difficult it would be to do so. A tool divided into two pieces would seemingly then be the best as far as this goes, and when these pieces are put together, it will give you a whole tool weighing 4 lbs., being one of fair serviceable size, and heavy enough to assist a man considerably when digging. Digging with a light tool, standing up, is difficult even in the most ordinary ground: take the heather round the Staff College or the ordinary hard burnt soil of India for examples; but if you want to dig half lying down, as a soldier might have to do, you must have something besides the weight of your arms, you want some weight in the implement. This remark applies equally, or perhaps more so, to axes or picks. The construction of an intrenching tool then should be to divide it into two pieces, and make each piece weigh something under 2 lbs.

Our next consideration is the sort of intrenching tools an infantry soldier should carry. The spade is of course a necessity, and Continental armies have, I believe, contented themselves with it; but in the most ordinary ground, a pick would be useful with a spade, whilst in many kinds of ground the spade would be utterly useless without it; we can easily imagine ground where it would be advisable to have even two picks working to one spade. Battalions would find picks useful in many cases; thus, a battalion may have gained ground with a rush which is very important tactically, and it is desired that the supports should throw up a shelter trench on it at once, to enable it to be held; or troops may get on some position where they have to wait under the artillery fire of the enemy, and want to throw up a shelter trench at once; in both these cases *rapidity is everything;* you want *serviceable* tools, and of *different kinds;* and as there is no knowing beforehand the nature of the ground, the troops should be provided with picks, in case the ground is hard. Again, an army occupying a position might have to throw up earthworks on it, either at important points or as cover for artillery; or there may be villages on the position requiring to be put in a state of defence, their walls having to be loopholed; or the same may have to be done by an army on the offensive, who may have taken a village and require to put it in a state of defence at once; for all of which work the more tools there are the better. Enough has been said to show that a pick would be a good adjunct to the spade if it could be carried conveniently, and though it

may not be sufficiently important to justify its being carried as an intrenching tool by itself, yet it is important enough to justify its being carried if this could be conveniently done, as, for instance, if it could be combined with some other tool which is absolutely necessary. Now there is another tool which might on some occasions be as important as the spade, and this is the axe. Take the case of an army occupying a strong defensive position some miles in length, and desiring to establish good lateral communications along it. There are most probably some wooded points impeding the passage of mounted troops; how useful it would be if at such a time these points could be at once cleared by ordering the regiments nearest them to do so, which would easily be done if each regiment carried a certain proportion of axes with it. Again, in a defensive position, clearing the ground in front so as to bring it under fire, is often absolutely necessary; also cutting down trees to form abattis on all sorts of occasions. Thus the American armies on both sides would have found an axe carried by their men of the greatest advantage in the wooded countries in which they fought. In fact, an axe is, generally speaking, a most useful tool for troops in the field to have always with them. Now if we could combine in one tool an axe and a pick, it would be a most useful one, and the combination would be of advantage to both on account of the extra weight thus obtained, as both a pick and an axe require a certain amount of weight in them to enable any continuous work to be done. The answer to our second heading, then, is that a spade, pick, and axe are seemingly the most useful tools for a soldier to carry. Of these the spade should be by itself, while the pick and axe are combined in one head.

As regards the handles for these tools, the simplest way for carrying them would no doubt be to have them permanently fixed to the tool-heads, but, as we have already shown in detail in an earlier part of the paper, the disadvantages of this are, that as the total weight must not exceed 2 lbs., you obtain a very small tool, and one inconvenient to carry. The handles must be separate from the tools—how shall we carry them? First, is it necessary to have a handle for the spade-head, and also one for the pickaxe? If it could be arranged that one handle would do either for the spade or pickaxe, and it could be shown that a smaller number of handles to the total number of tool-heads was enough for all practical purposes, the carrying of some extra handles would be saved. A handle can easily be made which will serve both for a spade or a pickaxe (and the handle on the table is an example), the plan of having it detached allowing it to be made a good length, an absolute necessity even in a spade, but especially so in an axe or a pick.

I will now attempt to show that a fewer number of handles than there are tool-heads will suffice. A reference to the kind of ground one meets with will make this more easy. In England the ground is usually more rocky than we meet with abroad on the European continent, mountainous tracts like Switzerland excepted. Generally speaking, ground is either rocky, clayey, sandy, or a mixture. According to its nature so will be the tools re-

quired; for the rocky ground you will want picks, for the sandy ground, spades. But you rarely get that mixture of rocky and sandy ground which requires your picks and spades to be exactly equal in numbers to work it. It will either require a greater proportion of spades to picks, or else of picks to spades; probably in most grounds you will want more spades than picks. It is no use, then, carrying an equal number of complete spades and picks; if you do, you will, when you commence digging your shelter trench, have some tools, either picks or spades, according to the nature of the ground, lying idle. Now, the tool-heads must all be carried, as you can never tell, till you commence to throw up a shelter trench, what ground you may meet with. But as regards the handles, the thing to do would be to carry only sufficient handles for the greatest number of tool-heads you could ever possibly have working at one time. Now this would be when you are working on rocky ground, and using all your picks, as you cannot throw up a trench with picks alone, you must have some spades; whereas in sandy ground, you might have all the spades working without any picks. Taking, then, the extreme case of rocky ground, you will want all your picks at work and a certain number of spades, and a proportion of one spade to two picks is probably the smallest proportion of spades you could use, viz., you want handles enough to work all the picks and half the spades together. Thus the number of handles depends on the number of picks it is decided a battalion should carry. Now, as we stated, England being comparatively speaking a rough country, the proportion of picks to spades should be about equal. It is the proportion laid down in the Shelter Trench and Pit Exercise, and it would also be a good one, as far as any intrenching tools like those on the table are concerned, as it would give a fair proportion of axes, the axe and pick being on one tool-head. Thus, if you decide to carry as many picks as spades, say 100 picks and 100 spades, you would require 150 handles. This proportion of 150 handles to 200 tool-heads would also have the advantage of giving a fair number of handles in reserve, making allowance for casualties, losses, breakages, &c. The number of handles then should be three-fourths the number of tool-heads.

We may now consider the number of such intrenching tools required by a battalion at war strength. Taking the strength of the battalion at 1,000 for convenience, the length of front occupied is about 400 paces, and as in the Shelter Trench Exercise, the men when extended to dig a trench are put 5 feet apart, the number of spades required would be 200.

The number of picks we have stated should be equal to the number of spades, making 200, whilst the number of handles is to be three-fourths the total number of tool-heads, or three-fourths of 400, making 300 handles, a total of 700 pieces; and as no man is to carry more than 2 lbs., or one piece, it requires 700 men out of a battalion of a total strength of 1,000 to carry its intrenching tools, the other 300 men would have nothing to carry in the way of intrenching tools. Similarly a weak battalion would require a proportionately fewer number of intrenching tools, and no battalion need ever carry more

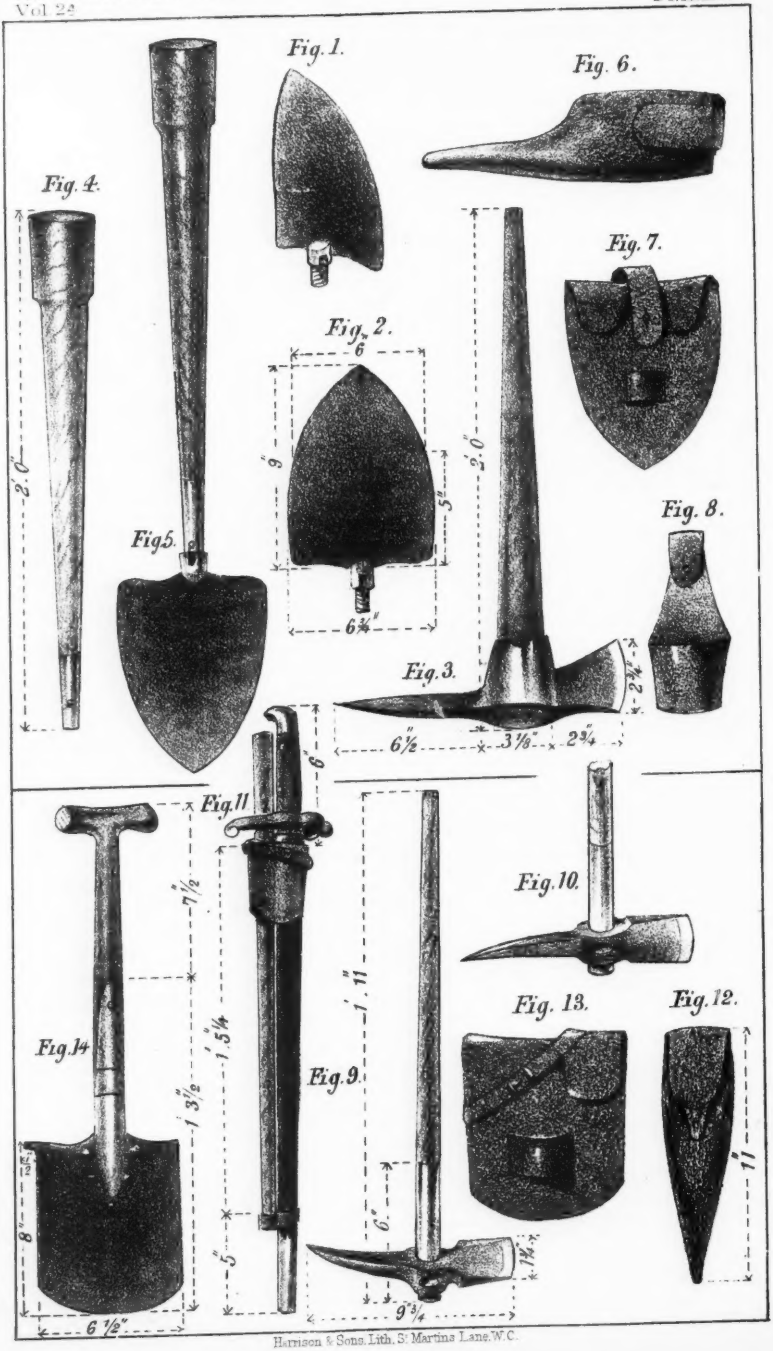
tools on parade than are necessary for it to intrench itself with, a calculation easily made. Thus though a battalion had its full complement of tools issued to it, as if on war strength, yet it need never carry more than are necessary; on service any extra tools would be put into carts and follow with the baggage.

I would now say a few words as to the method of bringing these different pieces together when the tools are required for work. The simplest way to do this is to ensure that every body of men of a certain strength has always with it sufficient tools to intrench itself with. Now, in our Service, the company is the first large unit we get, and it is a very convenient one for our purpose. No body of men smaller than a company would ever be likely to be sent on detached duty of any importance, as on advance guard or picket duty. So, if every company had always with it a certain fixed proportion of intrenching tools, there would be no chance of any body of troops ever being without them. The tools then should be distributed to the battalion by companies, each piece being marked with the regiment, the letter of the company, and a number, and entered on the rolls of the company against the man's name who has charge of it. And this distribution by companies should be kept to on parade; thus, when companies are equalized in peace time on parade, the men who are not carrying any portion of the intrenching tools should first be sent to other companies; or, if the whole company is broken up, the men should be sent by files, each file carrying a tool between them. As at present, men are sent indiscriminately, there is nothing standing in the way of their being sent in accordance with the tools they are carrying. Thus, a battalion on parade will invariably have its intrenching tools distributed equally amongst its companies, whilst, as regards the companies themselves, the tools will be indiscriminately divided over the whole company, some handles being in the front rank, some in the rear. If we take the strength of a company at 100 for convenience, each company would always have with it 20 spades, 20 picks, and 30 handles. A simple drill would ensure the pieces carried in a company being rapidly put together when required. It would be irksome to go into the details of such a drill here, but the following would seem to be the general principles of it. We will take the case of a battalion provided with intrenching tools similar to these, and having them equally distributed amongst its companies. The battalion receives an order to throw up a shelter trench. It would be drawn up in a general line in rear of the proposed shelter trench. Captains of companies will then give the word of command, "Men with handles to the front!" when all the men with handles and those carrying nothing would step out and form a front rank, two paces in front of the former front rank; the men with tool-heads will form a rear rank to them, all the men with spade-heads to the right and the men with pickaxe-heads to the left, each company working by itself, and keeping itself intact. The command would then be given, "Take over handles!" when the rear rank would take over the handles from the front rank, the front rank men either handing over the handle by itself or the handle with its frog (by unstrapping it from

his waist-belt), as may be ordered. This latter would be done when there was any chance of the company having to form up hurriedly, to enable the rear rank men to carry the handles themselves temporarily, till they get a chance of returning them to the front rank men; it would of course be a rare case, as the fact of throwing up a shelter trench implies a certain limited amount of time available. The front rank will then be marched off as a covering party. The rear rank, having piled arms, will then attach the handles to the tools thus:—If the ground of the proposed shelter trench is soft, 20 handles will be attached to the 20 spades, and 10 handles to 10 of the picks; if, on the other hand, the ground is hard, 20 handles will be attached to 20 picks, and the remaining 10 handles to 10 of the spades, at the discretion of the Officer commanding the company. Those men whose tools are to be in preponderance, viz., men with spades in soft ground, with picks in rocky ground, will then be extended along the line of shelter trench, and the men with the other tools with handles will be distributed equally along the line in rear of them. There will be 10 men in the rear rank of each company in possession of the surplus tool-heads, either spades or picks, without handles, and these men can be used as connecting sentries with the covering party, or as the sentries over the arms, &c. The trench will then be dug, and as there will be two men working on each task alternately, one working, the other resting, it will be dug in a much shorter time than if one man only were working at each task. To re-form the company, the rear rank will unscrew the handles, lay them down on the ground in a row, return the heads into their cases, take up their rifles, and fall in six paces in rear of the row of handles, each man in his proper place as he originally stood, whether as front rank or rear rank. Word will then be sent to the covering party, who will retire, each original holder of a handle picking up one as he passes the row of handles (it being immaterial which he takes up), and then fall in in his proper place. Special cases would have to be provided for in the drill; thus a battalion totally disorganized after carrying at the point of the bayonet a position which has to be intrenched at once; the general principles to be attended to would be that the shelter trench should be dug by the supporting line, the fighting line retiring through them to re-form, the front rank of the supporting line being sent out as a covering party, &c. Again, the extreme case of a position carried by troops with no supports, and requiring the trench to be dug by the disorganized troops. The best thing for them would be to get into some formation at once, which would be done in the ordinary way, by forming the men nearest to one another into companies; amongst each company thus formed there would certainly be a fair percentage of complete tools, the plan of their being in pieces scattering them over the whole battalion so, and the drill, as generally laid down above, would then be proceeded with. The battalion could then occupy the shelter trench, or be marched off.

I will conclude these general remarks by summing up the advantages which tools in pieces like these seem to have.

a. No man has to carry a greater weight than about $1\frac{3}{4}$ lbs.



Harrison & Sons, Lith. St. Martins Lane, W.C.

b. He carries this weight conveniently, not interfering with him when marching, shooting, or skirmishing.

c. The tools are serviceable ones, having handles long enough and heads big enough to enable good work to be done with them.

d. On any emergency occurring, as casualties, the tool in its case can easily be transferred from one man to another by simply unstrapping it from the waist-belt.

e. If there is no time to do this, only half a tool is lost instead of a whole one, as is the case with a tool in one piece; the plan of distributing the tools by companies preventing the chance of all the pieces of one sort, as the handle, being lost.

f. And finally the battalion has always with it three tools, a spade, a pick, and an axe, in sufficient numbers to make it independent.

I will now with your permission explain the tools on the table so as to exemplify these remarks (Pl. XXIV). I do not claim for them any superiority over any tools of the same nature that may be made. They are as you see rough patterns, being to a great extent hand-made, as they were not worth the expense of special machinery. They consist of three pieces, a spade-head, a pickaxe-head, and a handle, each in cases and each weighing in its case under 2 lbs.

The spade-head is 9 inches long by 7 inches broad; its sides, including the top one, are slightly dished or turned inwards to facilitate earth being thrown to a height with it. A male screw is fixed to the centre of its top side in such a manner as to give the spade-head when fixed to the handle the necessary curve to enable digging to be done easily. Its weight is $1\frac{3}{4}$ lbs. (Figs. 1 and 2).

The pickaxe is of the ordinary shape, except there is an axe on one side of the eye (Fig. 3). Its weight is $1\frac{1}{2}$ lbs. The principle of the Steel Heart Tool Company, Bristol, has been applied to it, which, by giving it a core of steel, is said to make it more *durable* than an ordinary pickaxe; this is a great advantage, as forges are not always at hand when wanted in the field, and both pick and axe are useless unless they are sharp. For these reasons, I would bring this patent of the Bristol Steel Heart Company to the favourable notice of the authorities for trial with a view to use in all picks and axes intended for military purposes. If the principle be not found to answer, the pickaxe would be made of ordinary metal.

The handle is interchangeable, doing either for the spade or the pickaxe. It is of wood, of an oval shape to prevent its turning in the hand when used with the axe, 2 feet in length, with a weight of $1\frac{1}{2}$ lbs. (Fig. 4). At the end to which it is intended to fix the spade is a female screw into which the spade-head is screwed (Fig. 5). A bolt is fixed to this screw to prevent the spade from unscrewing after being fixed on. At the other end to which it is intended to attach the pickaxe, the wood gradually forms a knob tapering up from the spade end; and to fix the pickaxe to the handle, the latter is run through the eye of the pickaxe in the ordinary way. The knob noted above as being on the end of the handle is also useful as forming a good grip for a man's hand when the handle is used with the spade.

They would be carried by the soldier as follows :—

The spade and pickaxe heads are in brown leather cases (Figs. 6 and 7). The handle is in a frog similar to that used for a bayonet (Fig. 8). They can be carried either on the waist-belt, the valise, or the great coat, there being straps and loops on the leather cases to allow of this being done. They are meant to be carried on the waist-belt as a rule.

The spade-head to be carried on the left side, just behind the bayonet or sword-bayonet, by strapping it in its case on to the waist-belt, the face of the spade being next the hip, and the top of the screw on the spade, being about in a line with the waist-belt. The pickaxe to be carried on the left side, just behind the bayonet or sword-bayonet, by strapping it in its case on to the waist-belt, the pickaxe being hung perpendicularly, the axe edge being uppermost. The handle to be carried on the left side, in a frog similar to that used for the bayonet, its end being run, if necessary, into a small leather loop on the end of the bayonet, which loop would have to be put on to the bayonet-scabbard about three inches from its end. Though normally a man would only carry one piece on his waist-belt, yet on any emergency he might carry all three or two by strapping them on to different parts of his waist-belt, as at his right side.

The spade-head could be carried on the flap of the valise by running the centre strap of the valise through the loop on the case of the spade, the screw end of the spade being nearest the ground, and its back being next the flap of the valise. The pickaxe-head can be strapped to the bottom of the valise by passing the centre strap of the valise through the eye of the pickaxe, and one of the outer straps over an end. The handle can be strapped perpendicularly to either side of the valise; straps for this purpose would have to be put on the valise. As already remarked with the waist-belt, three or two pieces could be strapped on to one valise on any emergency.

Similarly the pieces could be carried on the great coat by regiments wearing the present ordinary valise equipment.

The brown leather cases for all three pieces are made in such a way as to allow the piece in its case being unstrapped altogether from the waist-belt, or to allow the piece by itself being taken out of its case, leaving the case on the waist-belt. This is an advantageous arrangement, as a man can thus either unstrap the whole thing if he wishes to take it off; or if he is going to work, he can open the case and take out the spade or pickaxe, returning it again when no longer required.

The CHAIRMAN : I hope there are some gentlemen present who may be inclined to make some remarks on the paper to which we have just listened. After such remarks I shall ask Mr. Baillie Hamilton, of the Rifle Brigade, to show some tools that he has brought for our inspection. As the lecturer has said, I think we must confine ourselves to the question immediately before us; it is not whether or not intrenching tools should be carried with the troops, or whether, if carried, they should be carried by carts or by the men (that would open up a subject that would, though we are a small number, last a considerable time), but it is simply the value of certain tools proposed to be carried by the men, and it is to that point the remarks should be confined.

Colonel KEATINGE, V.C., C.S.I. : Without saying a word on the general principles

involved, I would only remark that I doubt whether Colonel Prior has got the best form of handle for his purpose. I have lately served five years in a hill country in the east of India, which is but little known, where the people have implements shaped like the ancient tools. Instead of a tool with an eye surrounding the handle, they use one like an ancient celt. It goes into the handle, only, whereas the old wooden handles required to be extremely massive, this is protected by iron, with a well-formed square opening; it must be square, because the tools inserted in it are used for different purposes, according to the way in which they are inserted. Into one handle a man will put two or three different implements. These tools are very much approved of. There are large public works going on in the Khasia hills, and our Public Works Department, which is officered by Royal Engineers, prefer the Khasia tools, and use them in preference to any others to be obtained in the bazaars. The system has also found favour in this country. Last winter I was surprised to see large gangs of men picking up the roads in Belgravia and in Victoria Street with picks made on a similar principle. They had a handle well shod at the end with a rectangular opening, into which the blades were put. Each man had three or four blades. We all know how rapidly they wear out in the hard work of picking up London roads. On becoming blunt they were put on one side, and I saw the men taking them off in large bundles, to be re-pointed. The tool is wedge-shaped, and it must be so made as to project a little through the handle, so that the man can knock it out. The Khasias all use hoes, and I have myself often seen a man take his hoe, sharpen it, put it back at right angles, and use it as an axe. When a man has to work lying down, I doubt whether a spade is as good a weapon as a hoe. I have seen a great deal of rough working with tools, and I doubt the practicability of the arrangement for fixing the spade on the handle, proposed by Colonel Prior. I am afraid the screws would get full of dirt: certainly it would require a stopper, and I apprehend that, after some working, the spade would work loose and would cease to come true to the front of the stopper.

Lieutenant-Colonel LONSDALE HALE objected, on the following grounds, to the principle of breaking up an intrenching tool for the sake of facility of transport:—1st. An Officer commanding a battalion, called on to furnish a working party, say, 400 strong, would, if carrying Colonel Prior's intrenching tool, have to lay his hand on double the number of men required to use the tools, viz., 800. 2nd. If all the 800 proceeded to the place where the work is to be carried out, half the number remain idle, or, if dismissed, have to be recalled again to receive their half of the tools at the termination of the work. 3rd. Colonel Prior loads a man fully with half an intrenching tool, so that if ever the man has to carry a whole intrenching tool, he would be overloaded. 4th. In order that one intrenching tool may be forthcoming during a campaign, neither of the two men must have been disabled. Not only must an intrenching tool be serviceable and portable, but it must always be forthcoming when wanted, and if one man carried the head and another the handle, the chances are two to one against this result being obtained, compared with the case of one man carrying a whole intrenching tool. Lieutenant-Colonel Hale, further, could not take for granted, without examination and trial, the technical good qualities of the tool produced.

The CHAIRMAN: I have but little to say on the subject, as I do not intend either to praise or criticize. I think the Chairman should keep himself impartial. One of the advantages of the Institution is the way in which utterly unexpected information is sometimes drawn out; and, certainly, what we have heard about the tools in the Khasia country is of the highest interest, and it shows what practical illustrations may be given us by those who travel much and observe while they are doing so. I scarcely ever remember any remark that has come in more appositely than the valuable information that has been given us to-day.

Colonel KEATINGE: I may mention that I brought home from the Khasia hills a collection of agricultural tools on the principle I explained, and gave them to the Christie Museum, 103, Victoria Street, where, I have no doubt, they can be seen by anyone interested in the matter. There are, also, some of the tools in the South Kensington Museum; I do not know by whom they were presented.

The CHAIRMAN: There is no doubt that a pick is a very necessary implement, particularly as an intrenching tool. In the case of an outpost having to place a

building in a state of defence, it is absolutely necessary. Something in the shape of an axe is also requisite. The Prussian Government introduced the Roumanian spade in 1875, and at that time they spoke of introducing the hatchet also. What became of the hatchet I do not know. I sent home the spade with its case, but the hatchet was not given to me before my appointment ceased. I was in hopes that Major Viethinghoff would have been here, and would have told us whether the hatchet had been introduced. Something of the kind is certainly wanted, particularly in breaking up ground where old roots are to be found. Colonel Prior mentioned the heathery ground about Aldershot as nasty ground to work in. I remember when I was first in Germany, in 1865, at some siege operations at Neisse, in Silesia, meeting an agreeable Russian General of Engineers, with whom I used to discuss all sorts of subjects after the day's work was over, and he told me that the worst piece of work he had to do was breaking ground through an old vineyard, and he added: "If anybody wished to make himself very disagreeable, I would recommend him to plant vines in a place where his enemy, twenty years afterwards, might have to cut a trench. I was so bothered (he said) because we had nothing with which to divide the roots." There is no doubt that some cutting instrument is a valuable adjunct, but I presume we do not consider the Roumanian spade to be the only intrenching tool with which an army in the field is to be provided.

Lieutenant-Colonel PRIOR: The plan mentioned by Colonel Keatinge is to have a handle shod with metal at the end with square holes, into which certain tools are fixed. I think that would be very good for general purposes; but the weight necessary for a handle like that of sufficient length would exceed the weight to be carried by a soldier. Colonel Hale advocated the two parts of the tool being in one piece, as being in two pieces doubles the difficulty. I think I have entered as fully as I can into that, by showing how the tools would be distributed by companies. The only disadvantage of a tool being in one piece is that you get such a small tool, weighing only 1½ or 1¾ lbs. If you want to do real work, you must have a tool of some weight in itself, besides that which you apply to it with your arms, and its handle must be of a certain length. In work done by soldiers, rapidity is everything. If you want a shelter trench thrown up, it must be done very quickly, and for that you want a heavy tool. The disadvantage of having a tool in one piece is that you load the soldier with more than 1½ or 2 lbs., whilst a tool of that weight is hardly heavy enough. With regard to the remark about 800 men, I make the number 700. A battalion has to carry 200 spades, 200 pickaxes, and 300 handles, making together 700. Suppose a battalion is called upon to *throw up a shelter trench*. Half would go off as a covering party at once, and the other half would dig the trench. The number of men, 700, makes no difference; half of them go off by the shelter trench exercise drill, which is the authorised drill to go by, while the other half are digging. If the men are required *as working parties*, which I think is what Colonel Hale refers to, suppose you have an extended position, and you have to throw up earthworks on different points. To do this practically, orders would be sent to regiments for working parties; the regiments would tell them off from different companies. Each company has 20 spades and 20 pickaxes; the working parties would be assembled on parade, and be marched off regimentally; they would throw up the work, and, having completed it, return. So, I think there would be no difficulty about that. With regard to the soldier objecting to have so much to carry, it must be remembered that, in the above case, he would only have to carry it a short distance, from his own quarters to the work to be thrown up; and he can carry it easily, because the two pieces can be put on to one belt, or the cases need not be taken at all, and the things may be screwed together before they start, and the tools carried in the hand. With regard to the technical objection to the pickaxe, I can only mention what was actually done with it. I have tried it practically myself and have found that it will cut down trees.[1]

[1] The question was difficult to answer, as no special objection was stated. If the objection related to the peculiar construction of this pickaxe, viz., its being made with a steel core, this would not be done if it was found not to answer practically; the pickaxes would be made of ordinary metal. The invention is a new one, and, if good, would be very suitable to military picks or axes.

Lieutenant the Hon. RICHARD BAILLIE-HAMILTON, Rifle Brigade: I do not show these tools (see Plate) in opposition to anything that Colonel Prior has advanced, but simply in order to help the discussion, nor do I claim any advantage for them over any other pick or shovel under consideration. Colonel Prior, in his interesting paper, pointed out the great necessity for carrying both a pick and axe, as well as a spade. Now, I may venture to say that, from experiments, I have found the Roumanian shovel to be almost useless on other than soft ground, without a pick. From experiments at Aldershot we found that if the ground was frozen or clayey, we could do nothing without some kind of pick? The part that houses and villages played in the late war of 1870 leads one to imagine that some tools should be carried by the fighting line with which they could readily loophole buildings. I need not dwell upon the importance of an axe also being carried, as Colonel Prior has already entered fully into that subject. With General Walker's leave, I will now show you a tool invented by me as a companion tool to an improved Roumanian shovel. It can be used as an axe, adze, or pick (Figs. 9 and 10). I propose that it should be carried in the proportion of about one pick to three shovels. The hatchet would be useful in cutting down and clearing brushwood and trees in the vicinity of the post to be defended: it could be also used with advantage for cutting over hedges, in order to put them in a state of defence, or for constructing obstacles, or cutting firewood, &c. The pick could either be used as such, or would prove invaluable for loopholing buildings or walls; the adze would serve for cutting stumps of trees, &c. The weight is about 3 lbs. with the case and handle. The handle is carried strapped on to the sword or bayonet (Fig. 11). It can be fitted to any sword or bayonet, simply by making the strap of the frog a little larger. The head is carried in a small case (Fig. 12) and is worn on the right side, as is also the shovel (Fig. 13). The advantages I claim for the tool are the following: it is simply and strongly constructed, it is light and easily carried, it does not interfere with the motions of the rifle, nor does it impede the soldier, whether marching or doubling; owing to its peculiar shape, it is easier carried than any pick as yet invented; the weight is so distributed that the shaft of the tool and the bayonet or sword exactly counterpoise the weight of the water-bottle and head; it could be made for a small sum; the head while working cannot come off; the head can be removed and reversed in an instant; it can be moved round the waist-belt, and is easy of access; the head is carried in a case which is neat, serviceable, and answers all requirements; when the bayonet is fixed, the shaft will prevent the bayonet-scabbard from being bent or broken. My Roumanian shovel (Fig. 14) is only an improvement on the other Roumanian shovel that we have had at Aldershot. The difference is, that it is made of cast steel, and it is about 1½ inches larger all round. It is better shaped: instead of being square, it is rounded. The handle is T-shaped, instead of rounded. I have had it cut away, in order to prevent it catching in hedges when men are doubling. I propose this should also be carried on the right side—that is, of course, supposing that the Oliver water-bottle were introduced.

The CHAIRMAN: Have you no fear of the head dropping on the hand?

Mr. BAILLIE HAMILTON: No, the more you work the tighter it remains.

General Sir WM. CODRINGTON, G.C.B.: The great fault of all these small tools is (and I think Colonel Hale will agree with me) their want of weight and substantiality for the purpose of working. That is the fault not only of these ingenious tools, but of those of the pioneers of a battalion. You see a man marching apparently with a crow-bar, but if you want to work a crow-bar you must have a heavy one to make it worth anything. So it is with the pick-axe. You have the pick on the one side and the chisel end on the other, so that you can work in rocky ground with one and cut roots and so on with the other. The great fault of these things, as I have said, is the want of substantiality for power of work. I will not enter into the question whether a soldier should carry more weight or not. One of the main things, if he cannot carry more weight, is to have such a tool carried as shall be efficient. With regard to the head of that tool on the table, I may mention that I know by my own experience that hunting men in Canada and the Indians always adopt that principle for a small axe-head. The handle has a knob at the end and is passed through the eye of the axe from the top. It can never fall off, can be easily replaced, and is by far the simplest way of handling such an axe.

The CHAIRMAN: No doubt a great deal of work can be done with an axe not

larger than this. I was five winters in Canada, and I passed a considerable time in the bush, and I never carried anything much larger. I carried a small axe at my belt for all the work I had to do.

Colonel Lord WILLIAM SEYMOUR, Coldstream Guards: I do not know whether I shall be in order if I call attention to a tool that has not been mentioned to-day. It has lately been suggested at Aldershot by Major Caldwell, of the 45th Regiment, but directly he saw Mr. Baillie Hamilton's tool he gave up in his favour, though I think it was mainly on account of Major Caldwell not having brought his own to a state of perfection. I should not have risen if reference had not been made to the value of a tool employed in the eastern parts of India. The principle of that tool is the principle suggested by Major Caldwell: it works as a pick and a hoe, the surface of the blade of the tool being like a spade. The man, therefore, gets the earth raised towards him, instead of working the earth away. If Major Caldwell had the opportunity, I am sure he would like to draw attention to the instrument, but he gave it up when he saw Mr. Baillie Hamilton's tools, thinking that they were the best.

The CHAIRMAN: What is this spade?

Major GROVER, R.E.: It is one of the experimental implements made at Chatham, where it has been proposed to devise a form of portable pointed steel spade, which will answer the purpose of both pick and shovel. That is one of the early forms, but it is, of course, not so perfect as the pattern which will eventually be made. It is observed, as one advantage of Mr. Baillie Hamilton's proposal, that all the parts of his composite tool are carried by one man, instead of by two or more. Reference has been made this afternoon to the importance of having a tool for loopholing walls, and it seems not to be generally known that the infantry bayonet will do such work perfectly. A Martini-Henry bayonet will effectually loophole a brick wall, without damage to its efficiency as a weapon. But this property of the bayonet does not, of course, affect the considerations concerning the value of any tool proposed to pick and loosen earth, or to remove large stones, which class of work cannot be executed with the Roumanian shovel, and the well-known form of the Roumanian or "Leinemann" shovel can hardly be commended, except for use in exceptionally light earth.

The CHAIRMAN: With regard to this shovelling tool, there is one improvement that I should like to recommend, viz., the taking away of this sharp edge and turning it over; this would give a greater weight on the upper part, and would also enable a man to put his foot to it, which he sometimes wants to do in digging ground.

Lieutenant-Colonel PRIOR: With reference to Major Grover's remark about making loopholes with bayonets, I may mention a case (which was privately told me) that occurred at Rorke's Drift. They wanted to bring men from one room into another. The doors were not opened; they had to break the partitions down, and they used the bayonets to do it. If these men had had tools of this kind on them, the walls would have been broken down much easier than with bayonets. They were able to do the work, but with great difficulty.

The CHAIRMAN: I am sorry that we have not had a larger audience to hear what has turned out to be a very interesting paper—and one that has drawn forth many valuable remarks from different quarters. One of the pleasantest features of our meeting has been to see so young a soldier as Mr. Baillie Hamilton, who is still Second Lieutenant, interesting himself so thoroughly in one of the most valuable parts of our profession. Often as I have taken the chair here, and much as I feel inclined to thank Colonel Prior for having given us a very excellent lecture, that has provoked a very interesting discussion, I have seldom had so pleasurable a duty to perform as that of complimenting one of our young beginners on the great interest he has shown in a very important portion of our military equipment. I hope he will take the compliment as heartily as I give it, and that he will go on until, when he has attained my rank, he may be able and willing to render the like service to the young ones behind him. I am sure you will all join in passing a vote of thanks to Colonel Prior, Mr. Baillie Hamilton, and the other gentlemen who have illustrated the question that has been brought before us to-day by their very interesting remarks. I hope that Colonel Keatinge will often come here and give us the benefit of his experience.

Friday, June 11, 1880.

Vice-Admiral WILLES, C.B., in the Chair.

Discussion on the Naval Prize Essay.[1]

Subject: "NAVAL TACTICS ON THE OPEN SEA, WITH "THE EXISTING TYPES OF VESSELS AND WEAPONS."

The Chairman: I have been asked to take the chair on this occasion from being by the accidents of the Service the Senior Officer of the referees, and under these circumstances I could not well refuse. I was absent in Italy when the Gold Medal was awarded, but I find Sir Cooper Key, in appropriate and fitting language, spoke of Captain Fremantle who won the prize, and of those Officers who were honourably mentioned, so that I need not allude any further to that subject, except to say that I was really astonished at the labour bestowed on the different essays.

Our proceedings to-day have an additional interest, owing to the presence of the noble father of Captain Fremantle, and also of his wife. I am sure that they will listen to the remarks that will be made with pride and pleasure. I cannot conceive anything more gratifying to them than to find that Captain Fremantle has been selected for the Gold Medal. I would venture to call your attention to the fact that Captain Fremantle is not only the son of a distinguished father, but the grandson of Sir Thomas Fremantle, one of Nelson's Captains who died in command of the Mediterranean squadron. Little could Captain Fremantle, when he took the "Neptune" into the battle of Trafalgar, have thought that a grandson of his would have a prize awarded to him for an essay on such then unknown subjects as the torpedo and the ram. Only conceive what a change it would have made in that battle if one of those monster ships that we now boast of had been present. I think it only right to say, that the referees by no means endorse the doctrines laid down by Captain Fremantle or by any other of the essayists.

I would venture to suggest that the subjects for discussion should be treated in the following order:—"the ram, the gun, the torpedo, and then fleet organization." With regard to fleet organization, I think we must all accept that, when once we go into action, the signal-book is pretty well closed, so that I consider we should to-day limit our observations to taking the fleet into action. I find that Captain Fremantle's ideas with reference to the ram are that it is exceedingly formidable; and in his imaginary action he destroys four ships out of six with his ram. He also advocates high speed. On the subject of the gun he advocates broadside fire, with bow and stern combined. I think the question of electric firing of broadsides is one of the most important that can be discussed. We shall be very glad to hear gentlemen give their opinions on the subject. Captain Fremantle tells us that torpedoes are offensive weapons, as yet quite in their infancy; in this I quite agree.

Captain Long, R.N.: I think, Sir, it may be convenient if I speak first, because I constructed those diagrams which you see on the wall before you. If there be any point in my essay[2] worthy the attention of the profession it is this: that it is an honest attempt to apply the principles of inductive logic to naval tactics. An Officer long absent from fleets, could not but waste your time if he attempted to argue about practices he has had no opportunity of observing. It is, however, open to him, and indeed incumbent upon him, to endeavour by

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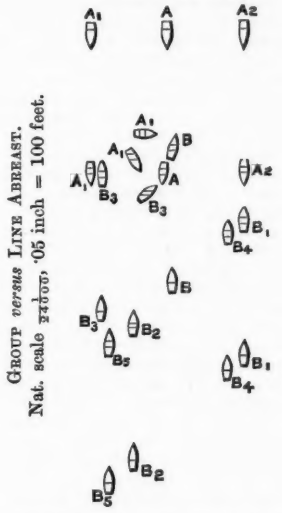
[1] Published in No. CIV of this Journal, page 1, *et seq.*—Ed.

[2] Honourably mentioned.

careful study of recorded performances, and a patient weighing of the facts available, to form some opinion as to how the object in view may best be obtained; here, fortunately, we have noble guidance. The voice of that great man whose last orders hang on your walls, and whose words will live for ever in the hearts of his countrymen, tells us to seek to "bring the enemy to battle in such a "manner as to render the business decisive." With such principles and so glorious an example before us, I think it cannot be long before the path of duty of the naval Officer is illuminated as it was of old. That illumination must undoubtedly come from experiment and practice. Observation and practice, says Sir Spencer Robinson, "are the two corner stones of seamanship." With regard to the ram, I quite agree with Captain Fremantle that the ram is a weapon of paramount importance in reference to tactics. I think a method of comparing the ramming powers of vessels is requisite, and suggest the following for the consideration of the profession: If you observe (*referring to wall diagram*) the vessel O is the "Thunderer," with a certain speed, and three positions are put down at the end of an interval of 42 seconds. Thus the ship in a certain position has a power of assuming certain other positions in a given time. In order to get into such a position that you may ram that ship whatever she does, you must be so situated that if she turns to the left hand you can ram her, if she go straight on you can ram, and if she turns to the right you can ram her; and that narrows the sphere of ramming very materially, and I submit that the power of a ram varies inversely as the length, because the length is in itself an objection, and directly as the distance between her centre of gravity under opposite helm in a given small interval. With regard to the gun, I think the principal point we can notice with any advantage here is the angular command. It appears to me it is a very important thing to be able to fire your guns near the keel. In No. 6 full-helm-diagram, arcs are shown 23 degrees from the keel in each direction, and 60 degrees from the keel in each direction. Now a ship when she is under weigh can be turned very easily through a small angle, and so turning does not affect her speed much; but if she has to be turned through a large angle it affects her speed very materially. It is, therefore, exceedingly important to be able to fire your guns near the keel line, but you may leave a few degrees, as much as a point and a-half, on each side of the keel with comparatively less fire; and as the principles of construction of the ship demand that the armament should be centrally situated, I think that is a matter of great importance. "The arc undefended used to be called angle of impunity." With regard to the torpedo I cordially agree with what Captain Fremantle says, and also with what our gallant Chairman says. I received a letter from Captain Fremantle the other day, in which he relates an experience at Malta, when ten boats went out to fire Whiteheads at a target, and out of those ten boats four torpedoes failed, and floated about without going anywhere. No range was given. The next point that seems to call for notice is "fleet organization," and on that I am qualified to say very little indeed, but I think one point in the Prize Essay requires notice. It is there suggested that the group should be of different numbers according to the size of the fleet, but afterwards the opinion is expressed that the French *peloton* reversed is the best formation for battle. Now it seems to me that if the unit of organization was of a different size to what you were going to use in battle there would be a difficulty. I think myself that we must start from the battle order and go down to the evolutionary, because the former is the end and object of the whole thing. It seems to me that Admiral Bourgois is right in his estimate of the best battle order, which is line abreast, and I have put on that board a diagram out of my essay with a view of helping the discussion of that question. The red ships marked A, A_1 and A_2 are three vessels in line abreast one and a-half cables apart. The black ships marked B are the other squadron. B_1BB_2 would be channel squadron group. B_4BB_5 would be Captain Noel's group. B_3 is the position proposed by me as a substitute for B_2 or B_5. Full references are given in the diagram. The point I wish to direct attention to is that vessels so far astern as B_2 or B_5 afford no real support to their leader, if the group be opposed by a similar number in line abreast, and I shall be glad if any one with practical experience will point out any error in this reasoning. What use, for instance, are $\overline{\overline{B_2}}$ or $\overline{\overline{B_5}}$ to B who is just going to be rammed by $\overline{\overline{A_1}}$? I conclude that superiority in number on the field of battle is now of much greater

importance than formerly, owing to the ram, and that a flank ship opposed to two would almost certainly be rammed. The only other point I can touch upon with advantage is the subject of manœuvring drill, or practice for Officers during peace.



Time interval, 1′ 29″. Speed, 10·44 knots.
B_1BB_2 Channel Squadron Group.
B_4BB_5 Captain Noel's Group.
B_3 Captain Long's substitute for B_2 or B_5.
A and B lose 3 seconds by collision.
A_1 shown turned 30° and 90° at end of interval.
One bar contemporaneous first positions.
Two bars contemporaneous second positions.

That is a point, I think, we are all agreed upon. The ram being re-introduced has rendered it necessary for Officers to be much more familiar with manœuvring their ships than was formerly requisite. The slightest mistake now in manœuvring your ship may cause her loss. It is, therefore, evident every Officer of commissioned rank ought to be competent to take a ship into action. I think what we have to consider practically is how this competency is to be obtained. I don't think it can be obtained by manœuvring in boats alone, though that would be very useful, but I should propose as a means to its attainment one drill, which should consist of one vessel being ordered by the Admiral to steer a certain course at a fixed speed, and another vessel being ordered to manœuvre round this one at a speed, say a couple of knots higher, with the limitation that she was never to approach within two cables. Her movement should be perfectly free except that, and the Officer on the watch should do it all, and the angles and bearings should be taken and the guns that would bear. A regular form should be made out. That is one drill I should propose. Another would be that one vessel should tow, at a cable's length astern of her, a couple of buoys with a distance line between them representing the length of the ship, and another ship should exercise ramming passing between the buoys. Other drills, such as Lord Clarence Paget initiated, would be very useful no doubt, but we

must have the two bodies in motion, I think, if we are to get any practical acquaintance with the matter. I wish to thank the Council very much for having brought this subject forward, whereby I think naval learning has been advanced.

Vice-Admiral RANDOLPH, C.B.: I am desirous of making a few remarks upon this subject, principally because Captain Fremantle, whom I am proud to call my friend, has done me the honour in his essay to make a great many allusions to myself. He has treated me very kindly, and I am happy to say that in nine-tenths of all that he has said I most cordially concur. To begin with the ram, I agree with him in considering that there is a very general concurrence of opinion that the ram is the weapon *par excellence* dating from the battle of Lissa. It is curious, however, because, according to his report of the battle of Lissa, we should have arrived at an opposite conclusion, for he represents that all the Austrian ironclads, and many of the Italians, attempted ramming, and none were successful. I venture, however, to think he is a little mistaken in some of his facts. I have in my possession an account written by an Italian officer of high rank, who was present at the action, which I believe to be as authentic as any could possibly be, and which on the face of it bears the stamp of the greatest impartiality, and which gives a different version. Captain Fremantle says that all the Austrian, and some of the Italian, ships tried ramming tactics, but unsuccessfully, and the "Ferdinand Max" only succeeded after some unsuccessful attempts, and the "Kaiser" was rammed by the "Affondatore," but remained afloat. My version is this, that Admiral Tegethoff's ship was the "Kaiser "Maximillian," and not the "Ferdinand Max." She made no unsuccessful attempts to ram the "Re d'Italia," nor was she rammed by the "Affondatore," nor any other ship. The "Re d'Italia" was transferring the Italian Commander-in-Chief, Persano, into the "Affondatore," and her rudder was disabled, and she was thus separated from her consorts. Admiral Tegethoff seized his opportunity, charged straight at her: in the words of my informant "literally tearing her in pieces, and "she sank immediately." The "Re di Portugallo" was the only other ship in the two squadrons that ever attempted to ram. We do not know what ship she attempted to ram, but Admiral Tegethoff saw the attempt, and again, in the words of my account, charged at her in the most dashing style. He did the ship very much damage, but also received himself so much damage that he had difficulty in getting into Lissa. Thus, although there were seven Austrian and nine Italian ships engaged, and a division of three Italians passed through the Austrian ironclad squadron, not another ship attempted ramming, so that confidence in the ram does not seem to get much foundation from the battle of Lissa; but unfortunately we have plenty of experience without that to justify the precedence that most of us give to the ram over the gun. I may remark that had the "Kaiser" been a ram, there is little doubt that the King of Portugal would have joined his brother of Italy, at the bottom of the Adriatic. On the subject of guns, I will address myself particularly to the points raised by Captain Fremantle, as to broadside *versus* independent firing. He endorses what he thinks is a general opinion in favour of broadside firing, especially against ironclads. Now, if he means that a certain number of shot striking simultaneously on an iron plate will more readily destroy or displace it than the same shot striking at intervals, that is a point I am not prepared to call in question at the present moment; but I suppose the most enthusiastic advocate of the concentrated broadside that ever was, can hardly expect such a result as that in action. And if the blows be not concentrated, but spread over a variety of plates, it is not very apparent that the effect would be greater. Probably the advantage looked for is neither in concentration nor in simultaneity, but in the greater certainty of aim. If that can be proved it would still be at the sacrifice of many opportunities for single shots during the intervals between the broadsides which assuredly would be vastly longer than those which are the result of target practice. Now I hold that no gun does its full duty, exercises its utmost power, unless it strikes every blow it has the opportunity of striking. If a gun is ready and bears, but is not allowed to be fired until others are ready, and then they have all to wait until the information of readiness is communicated to the director, who may not then himself be ready, I say that such a system is bad in theory and worse in practice, unless you can set off against it some counterbalancing advantage. What are those that are claimed for it? First, it is said the aim would be more sure and the effect

more severe. Where is the proof? Supposing a ship to pass a target at a chosen distance, fire a round independently, and every shot misses; let her then go back again, and fire a broadside, which knocks the target into shreds and matches. It is easy to imagine a spectator much struck by the success, and a young artillerist rubbing his hands and saying, "That is the style for me, would not that have "settled any ship?" But what has really been demonstrated? In the first place, if the independent shots had missed a target 12 feet by 20, it does not follow that they would have missed a ship. In the second place, if the target has been smashed into smithereens it does not follow that an ironclad would have been seriously damaged. In the third place, the target in this case was a fixture at a known distance, a condition impossible in an action at sea; and in the fourth place, the conditions are only possible under the supposition that an enemy chooses to expose himself to it by passing in an opposite direction. In the fifth place, if the distance had been within point blank, all the independent shot could hardly have missed. Again, it by no means follows that if the experiment had been repeated, the same result would have occurred; and again, the success of the director on this occasion no more proves that he would do the same in action than winning a prize at Wimbledon guarantees a marksman always to kill his man in battle. But the most important thing of all is this, that the target never fired in return. It makes all the difference. If it be said that nobody places any reliance upon experiments of that description, I reply, "I don't suppose for a moment that the older and expe- "rienced Officers do place any undue reliance upon them; but I am persuaded that "there are a vast number of younger Officers who do so, and who are misled into "wrong conclusions by it." The proof is this, that I constantly see the subject of going into action treated on the assumption that you may deal with the enemy just as you do with the target, ignoring altogether any free will or knowledge of tactics on his part, or any difference to be due to his size, armament, or special character; whether he shall be in a single ship or in company, and if in company, what formation or front he may present. Therefore I think a great many Officers are apt to be misled by these things. Now let us turn to facts, as far as they are available. Are there any that can be produced to show the superior or decisive effect of the broadside in action between ships, or from salvos from artillery on land, or from batteries upon ships? If so, I ask for their production. There are many to prove the conclusive effect of single shot or shell. 1. At Lissa a single shell set fire to the "Palestro," and she blew up. 2. A single shell in the "Huascar" turret, I believe, caused her surrender. 3. A single shell has often exploded a magazine, as at Acre, Odessa, Fort Constantine, and many other places. 4. There are numerous instances in the American Civil War of the decisive effect of single shot. One shell from the "Merrimac" set fire to the "Minnesota," and another blew up the "Dragon" tug. The Confederate ironclad "Atalanta" was conquered by one shot from the "Weehawken," &c., &c. And no one can doubt that a single shot may suffice to disable a rudder, a gun, a boiler, an Admiral, or a Captain, or even a turret or screw. Now the obvious reply will be, that each shot of a broadside has the same chance as if fired independently. But I think this is open to question, because if the fire be concentrated it should logically all hit one spot; and if one shot suffices, the rest are superfluous and wasted, and if the guns be not concentrated they must, also logically, strike only as far apart as the guns which fired them. But even if they have the same chance, I think I have already shown that an equal number cannot be expected to be fired, nor can any gun avail itself of its own best opportunities. Once more, if it can be maintained that the broadside system is best against a single ship, will it be contended that it is equally applicable when several enemies are present? Now I come to the question of electric firing. I cannot find more than a very slight difference between Captain Fremantle and myself on this subject. Captain Fremantle as well as myself rejects it altogether, except for the first broadside, and I have always admitted that possible, though not probable. Captain Fremantle's experience on the point of its reliability is greater and more recent than my own, and I am quite willing to defer to him, as I know a great many authorities agree in considering it to be perfectly reliable. However, I still think its efficiency has to be proved in action.

The CHAIRMAN: But my views are exactly yours.

Admiral RANDOLPH: So I think are Captain Fremantle's. Now just one word about torpedoes. I have no doubt that torpedoes will play a very important part in naval operations of the future; but I don't think the time has arrived when any person will be found ready to make the torpedo his base or principle on which he shall attack. Captain Fremantle lays down a maxim which I call a golden maxim, and if it did not of itself deserve the gold medal, I think it came very appropriately from a gold medallist. He says it is a maxim that I think "cannot be too often "insisted upon—that a choice must be made of a principal weapon, the others being "auxiliaries." Now, I think the man that hesitates, after having properly reconnoitred his enemy, in coming to a conclusion on that point and wavers between two or three different ideas or principles as to which he shall adopt, is lost. I can understand one Captain saying, "I am for the ram, but I expect my Officers to assist me "to the utmost of the power with their guns." Another may say, "I am for the "broadside principle, and if luck thrust in my way a chance to ram, I shall avail "myself of it, but I shall go in for the broadside principle. Therefore stand by "with your electric broadside." Both of those Officers will use their Whiteheads whenever they get an opportunity, but I don't think I shall find a third who will say, "I base my attack upon the Whitehead, and the other two shall be considered "only auxiliaries." It is true that Whitehead tactics may also suit the guns, but the speed must be much slower and the range much shorter than necessary for a gun, both of which circumstances will put the ship using them at a very great disadvantage with respect to its enemy. Besides that, I doubt very much whether a torpedo can be launched abeam from a ship going eight knots or even five knots, with very good chance of success. I doubt very much whether it can be launched astern in the wake of a screw rapidly in motion, or ahead into the wake of the enemy's screw; besides which, I do not think it can be relied upon at 400 or even 350 yards at all. Be all this as it may, I contend a man must make up his mind as to the principle on which he will attack. He may, if circumstances admit, take some time to deliberate, and even to consult about it, but before he goes within range, he must adopt his principle and carry it out resolutely to have any chance of success. I will just say a word on speed. Captain Fremantle and I are not on the same terms of accord as to the speed necessary in action. He thinks a high speed must be maintained. We all agree as to the value of speed, but we must remember it is no use being able to overhaul your enemy if, when you come up with him, you cannot fight him. Therefore fighting power must not be sacrificed to speed. With respect to speed in action, I think no uniform speed can be maintained; it must vary with circumstances. Sometimes it will be desirable to move as fast as possible, sometimes to turn in the shortest space, at others in the shortest time, sometimes to slow your engines, sometimes even to stop. It cannot therefore be uniform. I believe that, provided it exceeds that of your enemy, the slower the better, because you get better opportunity for your guns—better opportunity to observe and comprehend the movements of your enemy, and you have more power over your ship to stop if necessary, and in ramming may do yourself less injury, or a friend in case of involuntary collision, at great speed. Therefore I think the slower the better, with the above reservation. I omitted to say one thing about broadside firing. One advantage to be obtained from it is said to be freedom from smoke; that is, they say, that smoke interferes with independent firing more than it does with broadside. I am persuaded that if that be the case at all, it can only apply to the first broadside, and even then, if the enemy opens first, it will not apply. I think every action must be considered to be a scene of smoke and confusion, in which every opportunity must be taken of a clearance to make the best use of the power of each gun, and this I think is a great argument against broadside firing, because no gun can take advantage of its own best opportunities under that system. On the subject of manœuvring we very often hear complaints about the insufficiency of the information derived from the trials and turning circles in the steam reserve. Now, whatever the value of these circles may be to the architect and constructor of engines, which is infinite, I don't think they are of so much value to the naval Officer. We do not hear of enquiries about turning circles by pilots and harbourmasters and Captains before they take ships in and out of harbours, docks, or basins, or through channels, however intricate or tortuous. Besides this, they are an unreality. Does anybody sup-

pose that the "Thunderer" will ever do the same thing she did before? Did anybody ever hear of a ship in the course of her commission realising the same results as on her first trial? Will any ship turn in the same way whether she is light or deep, whether she is in smooth water or a heavy sea, in a tide or still water, with a clean or foul bottom, with a smart or slack movement of the helm or engines; and under these different circumstances will the same amount of helm always produce the same effect, whatever trim she may be in? Certainly not. No; I say if you want the ship to be well handled, you must tell the Captain to go to sea to make his own trials, pitch overboard targets and casks, and twist the ship about between them as much as possible, and habitually pick up the targets and casks by the ship herself instead of by the means of boats. Tell him to record all the results he can, and then when he and all the Officers are perfectly familiar with her movements, pay the ship off, promote those Officers, and appoint a fresh set green with the grass of several years' half pay, and I ask if you will expect the ship to manœuvre in the same way, however fully and accurately her previous performances may have been recorded. This brings me to a point on which I wish to lay some stress, namely, that there is another weapon of the utmost importance, and without which the others will prove of little avail. It is a weapon that is not forged in any dockyard or in any factory, and it is not a product of mathematical calculations or of co-efficients or co-ordinates or diagrams, but of a school we don't seem to care about possessing; for while we spare no pains or expense to obtain proficiency in gunnery, which may be useless without it, we do not spend a farthing in the production of this priceless weapon; and that weapon I call dexterity, dexterity in handling ships. Where are our Officers to obtain it? If any one will give me an answer to that question, it must be simply this, "In the Channel and Mediterranean Squadrons." I believe a high state of efficiency is attained in these squadrons; but I want to know where are the reliefs of these Officers being trained? I say no system will be satisfactory short of a school under which all Officers arriving at the rank of Sub-Lieutenants of, say, three or four years' standing, should have handled vessels under their own control. I think if every coastguard reserve ship with her gunboats and steamboats were made a school of instruction, and each in turn in summer in the different ports were made rendezvous for a mosquito fleet to be exercised in group-squadrons and sham fights, experience might be obtained by all young Officers in working ships, in handling engines, in all the tactics and evolutions of the signal book, an acquaintance with the harbours, rocks, and lighthouses, and pilotage of our coasts, and also an artillery and gunnery practice, vastly more extensive than can ever be obtained in a few enormously big, unwieldy, and expensive ships. If we had a system of that description, we should not have Officers obtaining their very first acquaintance with many of these subjects in the most advanced, most costly and vital part of our naval force, where a slight error in judgment might produce such disasters as those of the "Vanguard" and "Grosser Kurfurst." I wish in conclusion to express my high sense of the merit of Captain Fremantle's Essay, and particularly my satisfaction at his having been awarded the gold medal.

Captain CYPRIAN BRIDGE, R.N.: In the introductory remarks you, Sir, were pleased to make, you were good enough to throw out some hints as to the way in which those who took part in this discussion should proceed; and you pointed out that it would be as well if we took up particular points in succession and confined ourselves to them. I wish to address myself more to the general question, if I may be allowed to do so. In common with nearly every Officer here present, I have not had the advantage of reading Lieutenant Bower's or Captain Long's essays, both of which have been highly commended by the referees; but I have had the opportunity of reading Captain Fremantle's, and an essay by Lieutenant Eardley Wilmot, and also a synopsis of Captain Long's. I must say that careful and repeated perusals of all these productions have convinced me of the very marked ability which has been brought to the discussion of the subject by the authors; and I think it ought to be very gratifying both to the Service and to this Institution, that papers of such great importance and of such great ability should have been produced in response to the offer by the Council of the Institution of a gold medal. I also think it is only reasonable to believe that the country will be a gainer by the interest that has been awakened in this very important subject of naval tactics. Although

I do not feel qualified to examine particular points in the essays in detail, I think it will be very useful to try and see what lessons may be derived from them; to ascertain, in fact, what is the benefit accruing from the system of writing these essays. In the first place, the delivery of lectures on tactics and the writings of essays on the subject undoubtedly tends, and indeed has already tended, to stir up a wide interest on this too neglected subject of "naval tactics." In the competition for the gold medal, both the senior and the junior ranks of commissioned Officers were represented, and surely that is a great gain. In addition to that, present and former investigations of the subject have resulted in the evolution of certain maxims or tactical laws, which there is reason to hope will be extended in time, and from which we may eventually, and I hope before very long, be able to construct a complete Tactical Canon. I might point out what the result of these various discussions and essays has been. In the first place, there was that due to Commander Grenfell, namely, that in a turning action between two ships, the towing torpedo is useless, owing to its peculiar divergence, the inside torpedo tending to go to the centre of the circle on which the ship is turning, and the outside following in the wake; that for ever settled that question. Secondly, there was Captain Colomb's law, that every ship in her passage through the water carries on each side of her a circle of easily ascertained diameter of no inconsiderable dimensions, inside of which, no power on earth can place her; that is to say, that there was a circle of impunity on the side of every ship, inside of which, it was quite impossible for her to ram any object that presented itself. And, thirdly, we have Lieutenant Eardley Wilmot's rule, that the effective limit of range of the Whitehead torpedo is not more than 400 yards. That rule to some extent upsets the previous deduction of Captain Colomb's, which was perfectly true before the Whitehead torpedo had become available as a practical weapon. Fourthly, there was a rule derived from the experience of torpedoes in the late Turkish War which was contained in the paper contributed to a foreign periodical by a Lieutenant in the French Navy, for the translation of which we are indebted, I think, to Lieutenant Meryon, and that was, that if a ship is at anchor and liable to be attacked by torpedo-boats, there is a certain correct distance at which the obstructions by which she is protected should be placed, and that distance is thus found:—A torpedo-boat, in order to pass it, has to raise her spar torpedo, and the distance should be so short that she has not got time, moving at full speed, to get it sufficiently deep in the water to make it efficient when put in action. Then, again, there is Admiral Randolph's rule, that the maximum power of attack requires the freest possible use by each ship of her ram and guns. I have no doubt many other rules of the same kind might be derived from the study of the essays before us. I see myself, certainly, in Captain Fremantle's essay and also in Lieutenant Wilmot's, several rules that might be formulated as it were and made into definite tactical rules; so that I think we have no reason to be discouraged by the state of the question of naval tactics at present. It is quite true many years have elapsed since Officers first began to take great interest in it, and it is possible the results are not very great; but we really are now in a position to say:—"Here are certain tactical laws which are perfectly true, which cannot be "disputed, and which as long as the present *matériel* and the present kind of "weapons are in use, are universal and inevitable." Therefore, we are in a very much better position than we were before these essays had been sent in in competition for the medal; and I have no doubt that if the interest which has already been aroused by the wise and public-spirited action of the Council in offering a medal for such a subject is not allowed to die away, in a few years we shall be in a position to say we have got a tolerably complete set of tactical axioms, every one of which will be simple, intelligible, true, and easy to be remembered, and which will be most excellent guides for those Officers who have the fortune to take a fleet of British ships into action.

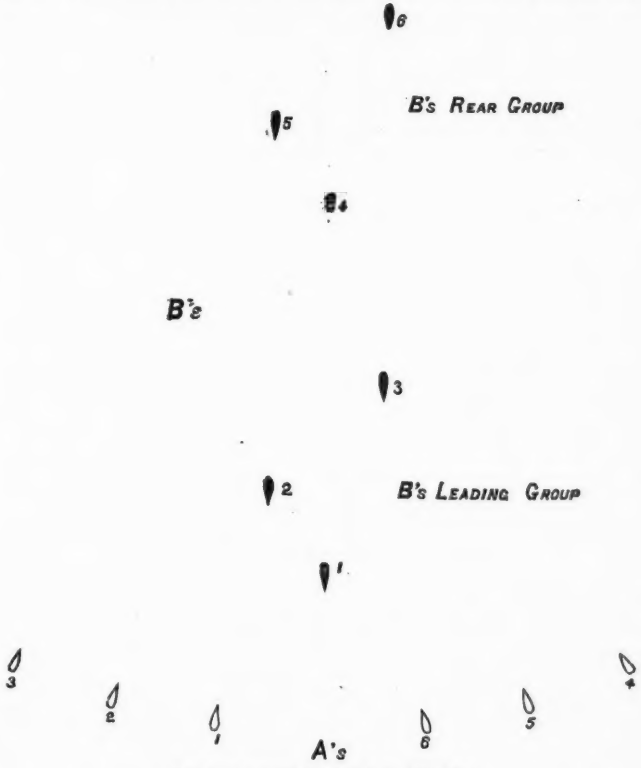
Admiral RYDER: When I was allowed to witness the commencement of Captain Colomb's War Game here some months ago, it came at once home to me that we should do as Captain Bridge has pointed out we had done; that is, we should bring out axioms of tactics. Those who learned Euclid in their youth know that we begin with our axioms, and everything is built upon them. I believe, as regards tactics, we shall from time to time strike out axiomatic truths which people will dispute

from time to time, and we may have the necessity to alter as we change our form of ships, but still which are essential to our consideration of this subject, and which we must always try to obtain. Captain Colomb's War Game interested many of you last year, and as I have been away from London, I do not know whether those Games have been carried on lately. We saw, however, in the newspapers the other day that in Russia they have become excessively popular with the naval Officers, who are a very patriotic, hardworking, industrious body of men, and that they are being fought at St. Petersburg and in the Mediterranean whenever Russian ships meet. I do not know that they have found their footing in the same way in our Navy, but I hope they will do so before long. I know in some ships, the tournaments are carried on day after day. I should like to supply a little information on a point that Admiral Randolph alluded to, and that is the battle of Lissa, which is the battle that we always fall back upon as an illustration when talking of ramming. When I was Naval Attaché I went to Polo in the "Adriatic," and there I had the good fortune to interview the Captain of the ship that rammed the "Re d'Italia," and he detailed to me the circumstances of the case. He said that on the morning of the action, Admiral Tegethoff summoned all his captains and the chief engineers of their ships to meet him and discuss what they should do as regards *ramming*, and the engineers, with one accord, so said my informant, stated "that no ramming must take place except "at very low speeds, because they could not answer that their boilers would not cap-"size, and of course scald the engineers." The Captains were very willing to ram—there was no objection on their part; but no decision was arrived at, and they all went away, each bent on doing what seemed right in his own eyes. The Captain of the "Ferdinand Max" told me he was determined to ram, and that in his first attempt to ram he stopped his way too soon, and never touched the ship. The second time he said he struck the ship lightly, and he believed from the report of the Officers, one or two plates were detached, or partly so, from the effects of the blow, but he stopped his way too soon to do any serious damage. When, however, the "Re "d'Italia" stopped in order to change the flag, he then determined not to be baulked a third time, and went at her full-speed, and made such a hole in her side that when he measured the mark on his bows the next morning to see the extent, they found that the size of the hole must have been 126 square feet. The ship sunk in about five minutes. About one hundred men were saved, and all the rest were drowned. That was the account given to me, and the "Ferdinand Max" was the ship that did it. I thought as I had this from head-quarters it might be interesting to you to know what was the exact state of the case. In this Institution, we have the opportunity of reading and discussing papers, and no doubt great benefit is derived by naval Officers from so doing, but that benefit is confined to those who are either stationary in London, or who, like myself on the present occasion, have been enabled to come here for a couple of days or a few hours. But Officers who are *actively* employed, except by the aid of our Journal, which is a very important part of our work, are not able to share in the discussions, or join in them in any way whatsoever. There was for a short time a very promising Institution at Portsmouth, which exists no longer, where young Officers had a similar opportunity. In foreign countries, however, things are very different. When I was going round France I found an Institution encouraged very decidedly by the French Admiralty. There was a room in every dockyard, well lighted, I have no doubt well warmed in winter, well supplied with newspapers and books of reference, to which young Officers were invited to go, and at which there were discussions weekly on important professional questions. Besides this, the French Admiralty give young Officers an intimation that unless they show themselves anxious and willing to improve themselves by availing themselves of all the means put in their power, their prospects of advancement will be rather diminished. Such a very slight intimation if given in our own case would, I have no doubt, have exactly the same effect; and all Officers worth anything would join in the discussions at places where opportunities were afforded them by the authorities so to do. The day I was there, I asked the Officer who was with me what had been the discussion on the day before, on which there had been a meeting largely attended. He smiled, and I saw he had a little hesitation as to answering me, but his reply was—"The point we were discussing, and which we "were all prepared to discuss, owing to the subject having been named a week

"before, was what the French Admiral at the Nile ought to have done, instead of "what he did do, when he saw Nelson evidently coming down to attack him." There was a most interesting discussion. They prepared themselves for it; they fought it out. Whether they improved themselves much by the discussion was immaterial, but there was a discussion on an important naval question; and in like manner they discussed all questions affecting their profession: of course avoiding disciplinary questions which would not be allowed. I hope to see this, some day or other, done by us in England. As far as I know there is nothing to prevent its being commenced this day month in every English dockyard at home and abroad. Captain Long spoke of ships exercising at sea, and the means taken to help the exercise of ships trying to ram, by towing buoys astern. I daresay it is well known to all of you that the Russian Government take the very greatest pains in drilling all their young Officers in gunboats, in ramming or attempting to ram one another. Protected by fascines in a very ingenious manner, they ram one another at very considerable speeds, and win great credit or the reverse, according to the way in which they distinguish themselves in these mimic tournaments, which are carried on every year in a certain bay at the head of the Gulf of Finland; and the greatest pains are taken in exercising their young Officers, not of course in ironclads, but in gunboats of considerable size. Another thing I noticed was that one of the ironclads was under weigh every morning at daylight, and the duty of the Captain was to go winding about among the ships, giving them the closest shaves possible without touching them. Boats were treated in the same way, always kept cruising about. I asked Admiral Boutikoff what he did if there was a collision. He said he was happy to say there had been no serious collision resulting in loss of life, or any great damage; but his practice was whenever any Officer had a collision, he always asked him to dinner that evening. He said he never could encourage them to approach sufficiently near each other to endanger collision. I do not believe that he is a romancing person at all; I believe that he told me the simple truth. I saw one Lieutenant make a collision in a cutter and lose his mast, and carry away the mast in his opponent's vessel. I believe he had a very good dinner at the Admiral's expense that evening. There was an allusion made by Admiral Randolph, when speaking of firing, to the question of smoke. I do not believe any of us attach sufficient importance to what will be an intolerable nuisance in future naval actions, and that will be our own and the enemy's smoke. We shall all long for gun-cotton, which, I believe, makes no smoke at all. When we have that, we can trust to the accuracy of our practice. But, I believe, even with smoke, and with a great deal of smoke, as long as the Captain on deck or an Officer in the top can see the trucks even of the ship you are engaged with, that by a very simple alteration in the exercise you can carry on independent firing, provided always some one on deck with the director can see the enemy, and if you are within a certain range.

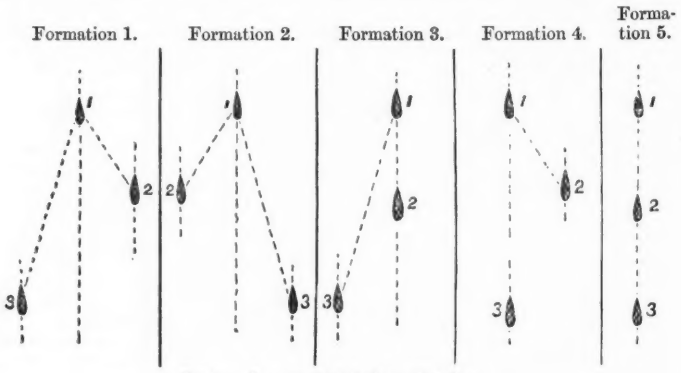
Commander NOEL (Gold Medallist, R.U.S.I.): As I see my name on Captain Long's board of diagrams, I suppose I am more or less called upon to speak at this discussion. I think as a whole, the Prize Essay is very instructive and interesting, and I only regret that Captain Fremantle is not here. I think, perhaps, criticisms might be more severe if he were present to answer to them. I also regret Captain Colomb's absence, as we all know he has done a very great deal for the tactical part of naval warfare. As regards Chapter I of the Essay, I do not intend to say more than a few words. I think Captain Fremantle has given all the different arms their relative value and position very properly: perhaps with the torpedo there may be a slight exception; but as far as this arm is at present known in the Navy, it receives its place very well as No. 3. I apprehend that torpedoes will become more offensive, in every sense, yearly. There is one remark about armoured decks projecting, and so protecting a ship from the ram, which I think is important, and might very well receive the consideration of the Constructive Department. In Chapter II we have some very instructive information on the turning power of ships. All this is very well for theorists, and again for the Constructive Department, but I think with Admiral Randolph, that when you have your ship at sea, you do not refer to such tables very much; you must learn what your ship will do, and work her accordingly. I do not particularly agree with Captain Fremantle in his tactics. We have in this chapter two ships opposed to one, and two against two. Now my

opinion is this, that if there are two ships to attack one, the second ship should be in the rear at about four cables distance from her leader. I shall refer to this again presently. Chapters III and IV give us some interesting extracts from foreign authorities, and contain a good deal of important information. As regards the tactical unit that Captain Fremantle speaks about varying with the number of ships in the fleet, I think it may be a good plan, but will certainly complicate matters, and, with a great many authorities on the subject, I am of opinion that the unit should be three ships, which may be called groups. I do not see any particular advantage in the French peloton reversed, as Captain Fremantle proposes. There is a large question which I think we ought to consider, namely, what is the real meaning of "support?" To my mind the whole question of support is very different to what it used to be. At one time, when we had nothing but sailing ships, the more ships you could get together *en masse* to support each other, and pour their broadsides into the enemy, the better; but in the present day, as a rule, the nearer your own friend is to you, the more dangerous he is to you. It will be a very great mistake if the ships of our squadrons are ever allowed to manœuvre in less than two cables from each other. What we want is this—a ship to be supported should have its consort well in rear, so that she can see



Scale $\frac{1}{2400}$, or 0·05 inch = 100 feet.

how the attack goes. If the leader is sunk, no support can be of any avail whatever; if she has delivered her broadside, and perhaps received a broadside, and still goes on, then the support comes up and delivers a second broadside, and, perhaps, if she is well handled, is able to ram, and sink the ship that has attacked her leader. In Chapter IV two squadrons of six ships are depicted as opposing each other. Captain Fremantle represents his ships, Fig. 10, the A squadron, more or less in line abreast: the upper one in the diagram, B squadron, he represents as in line ahead, and—as is too much the custom with writers when they attempt tactics on paper—the enemy is made to go straight on, never allowed to turn; in fact, the paper enemy is generally required to do what the writer most desires. Now I put Captain Fremantle's enemy, the B's, into two groups in line ahead, coming down on the squadron of A's. I think I should be very happy to see my enemy's ships in that line abreast in front of me. In the first place, I should go on straight through them, and if they proceeded on in the same course, they would perhaps get their inside broadsides to bear on me, perhaps a torpedo, or possibly they might try to ram. I should certainly have equal chances with them in ramming. I should have the opportunity of delivering both my broadsides as I passed through them, and if I had Whitehead torpedoes I could use them easily as my ships are all clear of each other; in fact, I think I should have the advantage. According to Captain Fremantle's diagram, 10 *A*, the A squadron all concentrate on the centre, and I should say that they would come out of it very badly. They would certainly be disorganized as a squadron, and I should think would be running into each other. I cannot make out how they would keep clear, as they all seem to be steering for one point. In any groups I should be very glad to see the A squadron in such disorder when I had passed through them, and I think I could get round and attack them again before they could re-form. The lower diagrams represent groups which I put forward in an Essay some years ago. There are there five formations of groups.



Scale $\frac{1}{2400}$, or 0·05 inch = 100 feet.

The first is with No. 2 ship, two cables and five points abaft the starboard beam of the leader; No. 3, four cables and six and a half points abaft the opposite beam of the leader. Formation No. 2 is the same reversed, and then what I think is a very important thing, I would have it in the power of the leader of each group, after a certain period (that is to say, when the ships are actually in action), by hoisting a single flag to place either or both Nos. 2 and 3 under protection in his wake. (See diagrams, formations III, IV, and V.) Though I advocate groups, still I think our signal books and all the orders with regard to naval tactics should be sufficiently copious to enable the Commander-in-Chief to choose his own tactics throughout. My opinion is that formations in groups are the best for squadrons, but still a Commander-in-Chief should have plenty of latitude, and not be

limited to any particular form of attack. The question of groups involves a great many others. One is the power of turning, or altering course. The groups as represented in my diagrams are rather wider than those which I believe are to be instituted by the new signal book; this book gives the second ship as two cables and five (or six) points, and the third ship three and a half cables and seven points, thus placing Nos. 2 and 3 nearer to the wake of No. 1, which I think is an improvement on the above plan. All that we want in a group is that Nos. 2 and 3 should be clear of the wake of No. 1, and yet in a position to support her. Now, as regards turning. Of course you would never turn by signal when in contact with the enemy. I should therefore recommend that in altering course (clear of the enemy), 2 and 3, by a slight movement of the helm, be directed to come into the position of formation V, which you see shows them in the wake of 1 "in single line ahead." Directly the signal is made for any alteration of course (if it is more than a certain number of points), 2 and 3 should get into the wake of 1, and when the signal is hauled down follow her round. It would be a very simple way of turning, and the ships should re-form groups on the new course without further signal. I believe the turning of groups has been a great difficulty hitherto; it is very important, because unless you can alter your course quickly your enemy may attack you when you are not ready for him. Another question of very great importance is the matter of doubling on the enemy. We hear a good deal about throwing all your strength on a part of the enemy's force, doubling on him, &c., but then we should not forget that the enemy may be as wise as we are. I know only one plan by which ships can double on the enemy, and that is one suggested by Captain Colomb, but even this can be frustrated if the enemy does what you do. His plan is this. Directly the leading ship meets the enemy she fires her broadside, and turns off at right angles, the ships being in line ahead; the next one that comes up fires her broadside at the same enemy's ship, and then turns off at right angles, following her leader, and so on with the rest. It is quite possible for the enemy to know of this, and do exactly the same thing, in which case we should not gain anything. For my part, I don't think it is possible to double on the enemy unless that enemy is very foolish. There is a maxim which I think rules most questions of tactics. "Ships should certainly ram when possible; but apart from ramming, "they will have been handled to the utmost of their tactical powers, if in passing "through the enemy's fleet each ship has had a fair opportunity of delivering both "broadsides of guns and torpedoes at a moderate distance." The great object seems to be to pass through the enemy, to take care that you get an enemy on each broadside, and with this view I am strongly opposed to anything like line abreast. It is to my mind the weakest of all formations. I think single line ahead is preferable, though this formation carries with it the great drawback of what the essayist calls being huddled into each other if one of the leaders is disabled. Yet if you put your single line ahead into groups you avoid that difficulty, and gain every advantage that line ahead can give. You can always follow your leader in every direction, and if attacking a line abreast, you can easily throw it out of order by a sudden flank movement, and then coming round on one side of the enemy's line, and engaging him before he could change front or be ready to receive you in anything like good order. There are three principles upon which naval tactics should be based. The first is, "facility for changing front or altering direction;" that is what I have just alluded to; it is most easily performed when in line ahead: second, "facility for "re-forming;" that I think is most easily accomplished by groups: third, the "fullest development of the several weapons to be used." With these three principles I conclude my remarks on tactics. I should like to say something on the subject of conning towers; it does not exactly come under the heading of tactics, but is closely connected with it. I am afraid we should never be able to manage our ships without their Captains, and in the present state of our conning towers I fear that in the first place the Captains could not steer their ships from them, and in the second place there is nowhere else from which they could steer their ships in safety. I think it will be very necessary that we should have armoured conning towers with a sort of protected retreat outside, into which the Captain could move when actually alongside or close to the enemy. All the communications with the battery, steering-gear, and engine-room should be inside the armoured tower; but the

Captain should certainly be free to move about on the outside, and yet be able to take shelter when necessary. I don't know that this is efficiently arranged for on board any ship we have at present. Another thing I should like to touch upon is the duty of torpedo-boats. No one has yet mentioned this subject, and I am afraid it is a very long one. What are we to do with torpedo-boats? If they are taken into action at the davits, they would simply be riddled like paper; if we lower them in a sea-way, I don't know where they could go in safety. (The CHAIRMAN: Open sea, mind.) Yes, I mean the long torpedo-boats supplied to sea-going ships. It is a very difficult question, and I am not sure we shall ever arrive at any decision on it. Before concluding I must congratulate the Institution on the special value and ability of the Prize Essay, containing, as it does, so much instructive matter. I would add that I have attempted to criticise only those parts of it to which I take exception.

Captain A. K. WILSON, R.N.: Although I came down here with no intention of taking part in this discussion, I should like to say a word or two on the questions of electric firing and torpedoes. To put myself in order I will just follow the course suggested by the Chairman, and first touch upon the ram as a weapon. No one can have any doubt whatever as to the effect of ramming if a collision takes place. We all agree that if a ship is rammed, the blow is probably fatal; but the difficulty in dealing with the ram as a weapon is this, that the difference between ramming and being rammed is only half a ship's length. That is the real difficulty of the whole thing. We can all draw diagrams on paper, in which we show that one ship rams another, but supposing the man who has taken these steps to put himself into a position from which he can ram his enemy, makes a mistake of half a ship's length, the action goes against him. It becomes almost a "toss up" which rams the other. Where a weak ship is attacking a stronger one, or a short ship a long one, so that there are some odds in your favour, it is no doubt an advantage to attempt to ram. Another objection to ramming as your sole or principal weapon is this, the means of defence given by the torpedo. The proper antidote to ramming is to carry outrigger torpedoes, both on your bows and on your quarter. If in that case you fail in your own attempt to ram, and put yourself across the enemy's bows, the result will be that you, having way on, and the other ship also having way on, you may be fatally rammed, but in that case you must swing broadside on to each other. That is inevitable. The enemy must come over your quarter boom, and it simply rests with your men being practised and tolerably quick for them to blow him up, so that at all events you get your revenge. Now with regard to electric firing. Admiral Randolph has made an attack upon electric firing, and I am afraid the Chairman is with him; but in spite of that, I must say a few words as an advocate for electric firing; and although I appear here as an advocate, and Admiral Randolph as an opponent of electric firing, I think from a few words he dropped, there is very little difference between us. Admiral Randolph almost said, if not quite, that he thought for the first broadside it might be of use.

The CHAIRMAN: Captain Fremantle says so distinctly.

Captain WILSON: My idea is this. I quite agree that it will be effective for the first broadside. The only thing is, I think, we shall have nearly all first broadsides. It will be this. Ships, unless they are steering on parallel courses in the same direction, must pass each other time after time, being sometimes in bearing and sometimes out of bearing. Directly they pass out of bearing, the main object of electric fire is that you should be able to concentrate your guns ready to attack the first moment when the ship comes into bearing again, and any one who has played Captain Colomb's War Game will see that is the commonest thing of all. You pass out of bearing, perhaps, having had only one opportunity for a shot. During that time you can concentrate your guns as far as possible, forward or aft, as the case may be, and they are ready the moment he comes into bearing again. So far from one gun waiting for another, it is quite the reverse. If you are to fire in this way in independent firing, the first gun that comes into bearing, gets his shot. Directly he has fired, his smoke rolls aft, and prevents the other captains of guns getting a shot at all. If you will take any War Game that has been played, and look how long your guns have been in bearing, you will find it is very often a matter of a few seconds. So short is the time, that before the smoke is cleared, your guns will be either out of bearing again, or you will have to re-train.

The CHAIRMAN: Tell us who fires this broadside in action.

Captain WILSON: Whoever is taught to do so. As Captain of the ship, I could easily tell you who is to fire it, but the great thing is that the man, whoever he is, should be selected according to the instructions, and thoroughly taught. His name appears in the half-yearly report on Gunnery, and therefore you can find it for any individual ship. It is above all essential that the man should be practised, not only at quarters when the ship is passing the target, but on every occasion when it is possible. You want to drill the man with the director thoroughly, so that whenever a ship is passing he should go through the motions and get his shot. The manipulation of a director requires considerable practice, and unless he is practised on every occasion, of course you need not expect very good shooting. I will now point out what are the cases in which electric firing cannot be used. Electric firing cannot on any account be used unless the ship is rolling, and unless you have perfect command of your helm. You trust to your helm to bring your sights on horizontally; you trust to the rolling of the ship to bring the sights on vertically, and unless you are doing those two things, do not try electric firing. If you are rolling, and if you have got command of the helm, you save time, because the instant any gun is out, the key is pressed as soon as the sights are on and it is fired. Our sole object is to save time, not to lose it.

Admiral RANDOLPH: You say electric firing depends on the management of your helm?

Captain WILSON: Unless the enemy will pass me.

Admiral RANDOLPH: I ask whether you can do that when you are in formation.

Captain WILSON: I must correct myself, and explain that. The enemy must in some way be brought past your sights. Of course it can be done just as well if the enemy will do it, as he naturally does in passing, as if you do it yourself with the helm; but there is no occasion to haul out of the line, if the enemy will only pass you, and any one who sees any of these War Games played will see how often it is the case that he does pass you. Just a few remarks about torpedoes. Captain Long has quoted some experiments in the Mediterranean, in which ten boats fired at a target representing a ship, and there were four failures. If there were ten boats mustered in the Mediterranean, the greater part of those must have been fitted with extemporary gear of different kinds; but taking it as it is, even supposing that that is the most satisfactory result that can be produced, I say that shows that the torpedo is a most formidable weapon. If you put it the other way, and say, instead of four failures there were six hits, and any one of those hits means the destruction of a ship, that shows it is a very considerable weapon. But then I do not say that that is thoroughly satisfactory, and I should like to point out how much practice had those men had, before they fired those shots. They probably would fire six Whiteheads in the course of the year. The whole question of the manipulation of delicate weapons of this sort, as well as of all complicated apparatus, is a matter of drill, and unless we drill throughly, we cannot expect to have them in order. The management of a Whitehead torpedo requires nearly as much practice as crossing upper yards. Now we should probably not have long to wait to see four of the upper yards go wrong at the morning evolution of the Mediterranean squadron, and yet the men are drilled at that, not six times a year, but at least three times a week. With regard to torpedo-boats, there is no doubt that the Nordenfeldt and Hotchkiss guns are a very heavy blow to the use of torpedo-boats in the daytime. Any one who saw those models at Portsmouth the other day fired at by the gunboat would see what a tremendous riddling they might expect to get. But, then, the circumstances were not fair, that is to say they did not represent exactly the conditions of attack by torpedo-boats. In the first place (we are dealing only with the open sea in this place) the speed with which the gunboat approached was about 9 knots, whereas the combined speed of a torpedo-boat passing an ironclad—for they would approach most probably end-on from ahead—might be 30 knots. The speed of a partridge when he is driven over your head is perhaps 60 knots, and we know the difficulty that there is in hitting in the case of the partridge. Perhaps there might be some similar difficulty in the case of the torpedo-boat. In the experiments at Portsmouth the gunboat was steered right up close to the torpedo-boat, whereas at sea there is no occasion to pass certainly nearer than 200 yards, and in

the view of the Nordenfeldt guns they would probably want to pass at greater distances. The method of attack I should recommend for torpedo-boats would be to come down from ahead if possible, and to pass at the utmost speed, that is to say, in the first-class boats. The second-class boats are obliged to turn end-on to the enemy to fire their shot. A few remarks were made apparently on the supposition that torpedo-boats could not be used in the open sea. No doubt they could not in a great many places, but I think we can all call to mind, day after day in the Mediterranean, when the water was as smooth as it is in the Thames, and it would be on those occasions that torpedo-boats might come in usefully. I cannot venture to criticise the essay in any way, for it is too long since I read it. The only observation with regard to the tactical question I should like to make would be this. The Prize Essay, and also the essays that received honourable mention, put line ahead on one side as a method of attack, but I should like to point out briefly what are its advantages. Captain Fremantle said that the only advantage of line ahead was that it prevented ships from running into each other, and no doubt that is one of the great advantages of this formation; but then you must remember that line ahead is also the very best formation for mutual support. Let me ask any Officer in command of a ship which formation he would like to have if he was in a fog, if he was going through intricate navigation, if he was going through a place crowded with shipping, or was making an unknown coast. I think in all these cases he would say he would like his fleet to be in line ahead. Now, in action we partake of all these different circumstances. You want to be in such a position that whatever move the enemy makes, you may move rapidly to counteract him, without endangering your ships by each other. In any formation except line ahead, if the leader turns without a signal he is more or less in danger from vessels following. In line ahead, any ship may turn in any direction. They cannot foul. As regards guns in line ahead, the only guns masked are the bow guns right ahead, and they of course are the least important. If you are in line abreast, both your broadsides are masked. If you are on bow and quarter line, the following ships are exactly on the bearing in which your torpedoes will run, and therefore in danger from your own torpedoes. If the leader is rammed, so far from the rest of the squadron being huddled up in a heap on top of her, the next ship has the choice of just giving sufficient helm to ram the rammer, or giving a little more helm, and shaving him and putting a spar torpedo under him, or giving a wider sheer, and then giving him a Whitehead in passing. Every following ship as she passes the rammer and the vessel he has rammed, may pour another broadside into the rammer, and so revenge him; so that, whichever weapon I take, the line ahead appears to be the best formation.

Lieutenant CHARLES CAMPBELL, R.N.:[1] If distinguished Officers of long service and high standing in our profession apologise for taking up the time of this meeting, how much more must I feel that an apology is due from me who am but a few rungs up the ladder. But, gentlemen, Sir Astley Cooper Key, from the chair at the General Meeting of the members of this Institution, exhorted young Officers to come forward at these discussions and freely express their opinions, and I feel that it would be unmanly on our part to allow our natural modesty to interfere with our giving his encouragement a fair trial; and besides, as the writer of one of the competing essays on the all-important subject under discussion, I am glad of an opportunity of stating, in the presence of so distinguished an audience, how much I feel the honour of being in the same boat with the author of the masterly combination of science and practice which gained the gold medal. First on the quality of speed. Of the many points that have been established by naval tactical authorities and aimed at by naval architects in this and other countries, speed stands pre-eminent and alone as the first quality of a man-of-war. Without speed you cannot insure an action with an inferior force; without speed you cannot decline an action with a superior force. The author of the Prize Essay places speed as second to the length of the spur or ram, but afterwards places it as of greater moment to a ship than turning power. Admiral Selwyn, in his most valuable paper on "the most "powerful ironclad," places speed as second after gun power, "speed with small "consumption and great fuel capacity." There is no doubt the opinions of these

[1] This Officer's Essay was honourably mentioned.—ED.

pioneers have not been arrived at without considerable thought and for sound reasons; but nevertheless I would submit that speed holds the first place. In ramming it as it is in cooking, you must first catch your hare before you can cook it; and you must catch your adversary before you can ram him. Handiness is unquestionably of vital importance to a ship, and where the armaments and build are equal, it is almost equal to the quality of speed. On the gun, I would submit that in tactics the gun should be subservient to the ram, and made to aid in developing its power. Commander Noel, in his Prize Essay, advocates the use of electric broadsides in a fleet action, fired by the Captain, reloaded, and laid abeam or 10° before. Captain Fremantle only goes with him as to the first broadside, but the general opinion seems to be that all actions will be commenced with the gun, fought out by a mixture of the gun, ram, and torpedo, and concluded with the ram. The principal use of guns in action is to keep the adversary in a constant reception of projectiles, whether from a Woolwich infant, upper deck torpedo defence guns, machine guns, or rifles, thereby keeping his directing Officers inside the conning towers, and reducing their time for cool reflection to a minimum. It is impossible to estimate what effect a well kept-up machine gun-fire may have on the issue of an action. It certainly would greatly increase the chances of the ship using them, being able to fatally use her ram. Opinions differ as to the manœuvres to be employed in order to ram; and as to the difficulty or ease with which rams will be used in a fleet action, but the international verdict, given by the tacticians of the day, is that the weapon of the greatest importance is the ram, destructive in its action, disastrous in its effect, requiring nerve, coolness, judgment, and practice in its use. Even those who place the gun on an equality with the ram agree that we must fight *unguibus et rostro*, with "talons and with beak." With single ships I would follow Admiral Randolph's line, believing that in making a ramming attack I should be making the best defence against it; and I should endeavour to act up to the words on the frontispiece of Sir George Nares' "Seamanship"—"Keep her bow on." With two ships I should prefer quarter line, two or three points from the leader's keel line, that being the position most easy of change on closing; for my contact formation must depend upon the tactics of the adversary. With three ships I would fight them as a group. I am an advocate for group formation, but I do not go so far as Commander Noel, in having five positions in which groups are exercised. I cannot help thinking that to give a group these five formations would be something like putting it into a straight jacket.

Commander NOEL: The third and fourth are merely calling certain ships under cover. They are not a different formation.

Lieutenant CAMPBELL: The point I wanted to make was, that I advocate their following their leader, not having any formations laid down for them. With fleet organization, the present plan of having two organizations, one by seniority for cruizing, and the other by choice of ship's powers for group formation, the only absolute rule being that the commander of a group must be the senior in that group, is very simple and works well. It is now common to have two or more organizations in a fleet, and to pass from one to the other by displaying the divisional flags. I would submit that it is important that a Commander-in-Chief should have the option of placing his ships ready for action, in other positions than those necessitated by seniority. He may wish his longer ships in one position, and short, quick-turning ones in another; he may want his experienced Officers for one class of work, and his young Captains for another. Admiral Jurien de la Gravière tells us, "*Quand la "Victoire déploie son aile, il faut les jeunes Capitaines pour la suivre.*" Then about signals. The most important alterations of late in signals are the amalgamations of the instructions, the introduction of the mercantile code into the new manual, and last, but not least, the use of the compass pendant over and under numerals for alterations of course together. I have advocated the introduction of the six-pendant or other symbol over and under numeral flags for alterations of course in succession; and were that in use, I maintain that we could perform all the rectangular movements without reference to the books at all. I deny that "the use of signals in action has been generally condemned." On the contrary, I believe that expert tactical intercommunication in action will prove more than ever of vital importance—not only by day, but also by night—and I fully agree

with Captain Colomb, in one of his lessons from Lissa, where he says: "I think that "Lissa shows the value of concerted movement, and efficient signals are the only "means of securing it."

The CHAIRMAN: Supposing there is smoke from the guns and funnels, how would you make signals?

Lieutenant CAMPBELL: I advocate strongly the use of the semaphore.

The CHAIRMAN: How are you to make a signal?

Lieutenant CAMPBELL: I believe it will be of great use in action having the compass pendants over and under the numerals.

The CHAIRMAN: But you cannot see anything!

Lieutenant CAMPBELL: Of course, if that were the case, the signals would be useless.[1] On the training of Officers, strongly as I feel on this point, I would only add my testimony to what Admiral Houston Stewart said at the discussion on Captain Pellew's paper at this Institution, and the statement of Admiral Randolph in discussing Captain Colomb's paper, when he said, "I hope to live to see the day when "the profession will be trained under a system, and so thoroughly, that we shall incur "no danger of losing our position in the naval world." I would submit that exercise and training are everything; as we sow in exercise so we shall reap in action. Gibbon tells us, "So sensible were the Romans of the imperfection of valour without skill "and practice, that in their language the name of an army was borrowed from the "word which signified exercise. In the midst of peace the Roman troops familiarized "themselves with the practice of war, the effusion of blood being the only circum-"stance which distinguished a field of battle from a field of exercise." And are we to be behind them in our exercise and training, when Daniel Webster tells us that "Rome in the height of her glory was not to be compared to a Power which has "dotted over the surface of the whole globe with her possessions and military posts, "whose morning drum-beat, following the sun and keeping company with the hours, "circles the earth with one continuous unbroken strain of the martial airs of Eng-"land?" I believe that exercise and training, and nothing but exercise and training, will win fleet actions; and on the day when fleet shall meet fleet in one mighty effort of destruction, happy the Admiral in command, to whatever nation he may belong, "who shall find midst the crash of the charging masses and the din and "turmoil of battle, that all his tactical details are perfect and his Commanders "possessed of that unity which is strength, and that knowledge which is power." If I have a leaning at all to the formation of a fleet, I would say groups in quarter line. With regard to the use of the force, I would submit as a rule, with very few exceptions, a fleet should be fought as a whole and not separated, but guided throughout as one body by one head. I agree with Admiral de la Gravière that "*Manœuvrer à distance est souvent fort habile, garder toutes ses troupes sous la* "*main est plus sûre.*" I would submit that the arm exercising paramount influence is the ram. In conclusion, I would advocate as a tactical axiom that the exclusive adoption of any one form of attack, either by groups, pairs, or single ships, is not of so much importance as the tactical knowledge of the Commander-in-Chief and the Officers under him, of *all* forms of attack and their power of changing from one formation to another with rapidity and precision. I do think, though, that the group-formation has certain merits of its own which develop to the utmost known extent the offensive power of the gun, ram, and torpedo, distribute the responsibility, and generally increase the mobility and flexibility of the Fleet, and that oblique lin before attack combine the largest scope for deceiving the enemy with the greatest ease in changing course and formation. I must gratefully thank you, gentlemen, for the, I may say, more than courtesy with which you have listened to the opinions of others which I have ventured to express—in fact, I may follow the idea of Montaigne and say that "I have here laid before you a nosegay of culled flowers, "and have brought nothing of my own but the thread that ties them."

Captain F. G. D. BEDFORD, R.N.: I should not have spoken had it not been that the question seems to have turned so much on electric broadsides, and I happen to have had some practical experience as to how they have worked. In the eloquent

[1] I believe the Siren would be of great use.

defence of the broadside just now by Captain Wilson, he laid it down as a necessity for their usefulness that there must be motion enough to make the ship roll, and that you must have command of the helm. It is obvious that in an action on the open sea between two ships, they must pass over the sea in different positions, that is to say, at one time they may be broadside on, at another time bows on, &c., and in each of these positions the ship will either roll, or not, according to her build; at one time she will be perfectly steady, and at another time she may be rolling as much as 15 or 20 degrees, and it may happen after wasting an enormous amount of time in getting ready to demolish the enemy with this one broadside, you find she will not roll the sights on. I have experienced this mortification with regard to the command of the helm; some ships are very sensitive, and it may happen that for one reason or another it is necessary to jamb the helm over suddenly, thus causing a steady heel of some degrees just as you want to fire, and then where is your broadside? I do not mean to say that there are not times in which the electric broadside may be useful, but I believe, as far as my experience goes, it is not desirable to lean too much on it. A word about ramming. We have had a great deal of experience about ramming since Lissa, but for the most part it has been when both ships have been trying to avoid it. It seems to me the remarks made on the subject of training Officers in handling ships deserve to be thoroughly worked out, but all the tendency of the essay goes to show that the Captain of the ship is to be the person to ram. If he is, and he certainly ought to be, he must attain the proficiency necessary for doing it effectually by continually manœuvring his own ship. Steam tactics alone will not do it: they are mechanical movements. You know what the other ship is going to do all the time. They may teach you certain formations, and what your ship will do under certain conditions; but when we know that every breath of wind, every ripple on the water, every revolution of the screw affects to a certain extent the steering powers and turning powers of the ship, it can only be by long and constant practice, by working up under different conditions, taking the ship in and out of harbour, moving her about among other ships, &c., that a Captain can feel that when the supreme moment arrives HE is the man that can take advantage of it. We must come to that now. As we have grown up in the Service we have seen the relations between the Navigating Officer and Captain greatly altered, and they are altering every day. As amalgamation develops, so they must alter entirely. There must be no divided responsibility about it, or there will be failure. It would be like the owner of a coach who contented himself by sitting alongside his driver day after day without learning to drive, only directing him which way to go, exerting his authority when the moment arrives when skilful driving can alone avert a catastrophe, and saying, "Now! hand the reins over to me."[1]

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[1] These remarks, made on the spur of the moment, were suggested by the enormous importance (and rightly as I think) attached to ramming, both in the essay under discussion, and in other paper battles. But the difficulty of delivering an *effective* blow seems sometimes under-estimated, and no mere bump, or graze, or half-hearted collision will be sufficient in these days of twin screws, divided engine rooms, and multiplied water-tight compartments. There are cases of late years where ramming has *not* been tried, but has succeeded only too well; but there are also several where it *has* been tried, and failed. First. The "Shah" saved from the ram of the "Huascar" by her superior speed and steam-steering gear. Second. The case of the "Huascar" and "Esmeralda," where the latter, a poor, broken down little wooden corvette, was only demolished by the third assault of her powerful adversary: an account of the engagement, with reference to the ramming says, "The two "first attempts at sinking the 'Esmeralda' by this means proved ineffectual, as she "turned, and the monitor's ram passed glancingly along her side; but the *third* effort "sank her, striking her fair amidships, and causing immediate submersion." If the poor "Esmeralda" had been able to steam at all, the "Huascar" might never have had a second chance, let alone a third. On the same day as this occurred, and but a few miles away, the Peruvian ironclad "Independencia," despairing of ever hitting with her guns the "Covadonga" (a Chilian gun-vessel that she was chasing), attempted to ram her, but went ashore, and was lost herself instead. Lastly, we

Vice-Admiral SELWYN: I was just going to say one word on a subject on which there seems to be a lingering mechanical fallacy. All our experience of collisions shows us distinctly that the greater the speed of the ramming ship, the less damage is done on board her, and no Officer ought to slow his ship down to a ramming speed on any condition, if he does so, he ensures more damage to himself than to his adversary. As my name has been referred to in the course of the discussion as putting gun power higher than speed, I beg to say on that occasion I was speaking of the most powerful ironclad, and I had in my mind's eye certain proposals to arm merchant ships of high speed which, had they had the value which some of their advocates believe, would have amounted to this, that nothing but speed is necessary. I quite demur to that, and it was only on that occasion I departed from my usual custom for many years past of insisting on the highest speed possible, for the longest time possible, being always given to men-of-war.

Admiral ROBERT STOPFORD: I should like to say a few words on tactical formation. Twenty-two years ago I had the honour of sending to the Admiralty suggestions for certain tactical formations to be put down in the Signal Book, such as line ahead, line abreast, and bow and quarter line, with instructions for steam evolutions. I was always in favour of line ahead, as affording the greatest amount of mutual support, and you can get into any other formation more readily than from any other position. I believe at the first touch, every formation you ever met with, will be broken up. I think the Signal Book should provide for every possible formation and every possible evolution; and also that it should leave to the Admiral's discretion what use he may make of these signals. With respect to ramming, I think Officers of the Fleet will be very chary of ramming, and for these reasons: one is, if you ram your enemy you are from that moment temporarily, to a certain extent, disabled yourself, and are more liable to be rammed by others of the enemy. I would ask any Officer here would he not much rather bring his prize into Spithead than sink her in the Atlantic? Would he not much rather go alongside of her and take her than sink her? And suppose you do ram your enemy, and see her sinking under your bows, would you not attempt to save her men? and if you do that, you are open to attack on all sides; so that I really think people would think twice before they ram, except in self-defence.

Commander W. DAWSON, R.N.: I rise to say how thankful I was to read such an able Essay written by Captain Fremantle, and that I am still more thankful to him, for not only giving us his most instructive Essay, but for being the means of giving us this most intelligent discussion. The remarkable part about this discussion to my mind is, not only the intelligence it has brought forth, but the persons who have spoken. Officers on the active list have actually opened their mouths on a professional topic. We have had active Officers of all ranks getting up to instruct their brethren with well-formed opinions of their own on a most difficult professional subject. I have listened to many discussions in this Institution on naval tactics almost exclusively conducted by retired Officers, and I have come away saddened by the fear that Officers on the active list had not formed any opinions at all on how battles should be fought. We have altered all that. Here, to-day, I find active

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have the action off Angamos Point, where the "Huascar" was taken by the two Chilian ironclads, and where attempts to ram were made by both sides, and failed. This can hardly be wondered at as far as the "Huascar" is concerned, for her proper steering gear was disabled. But what can we learn by the failure on the part of the Chilians? Their ships were twin screws, exceptionally short and handy, and one of superior speed to their adversary, and yet they could not make use of the most effective offensive weapon they were fitted with. Why? Probably some slight error in judgment, a few degrees too much, or too little helm; a few revolutions of the screw too much, or not enough, or a mistake in judging distance. Any of these would be sufficient; and though the failure contributed materially to victory by bringing them to such close quarters, that every shot told, it all goes to prove what constant education in the art of handling a ship, what keen perception and judgment to seize the opportunity, and what coolness and nerve are required to carry ramming through to a successful issue.—F. G. B.

Officers on all sides discussing this important question, and not afraid to express their decided opinions. Actions are decided not so much by our having the most correct plan, as by the Officer who is in command having some decided convictions of his own. I had intended to discuss the tactical movements which should follow the first encounter between two fleets of mixed armoured and unarmoured ships; but at this late hour I merely rise to express my personal gratification at the instructive discussion to which we have listened.

Commander CURTIS: I think there should be certain instructions with respect to the Signal Book, that a ship in turning to port should keep clear of her port ship, and in turning to starboard, the ship should keep clear of her starboard ship; because we did hear that the "Achilles" and "Alexandra" fouled one another; and it appears the "Alexandra" ran across the bows of the "Achilles" because she turned quicker. With regard to the ram, the question has been raised whether we should ram at full power. Admiral Randolph said we should slow in action. We are told to keep full power, so as to keep or get within the enemy's tactical circle, and that if you slow, you give your enemy an opportunity of getting within your tactical circle. The use of the Whitehead torpedo scarcely seems to be appreciated under such circumstances; and with regard to the spar-torpedo attached to ships, according to some Officers, the opinion with regard to them is not favourable. But there are other means of ejecting torpedoes from ships to some 30 or 60 yards, which at present are not in vogue, and no doubt they will come into force at some future time. In such a case, and ships armed with spar-torpedoes, with two ships colliding, their destruction will be mutual. As to the conning tower, I may say that if the Nordenfeldt gun concentrates its bullets on the conning tower, I would defy the Captain to look out of it, because the lead splutters, and is melted, and would blind any one. With ships in line the old maxim was, never mind the man in the rear, all you have to do is to mind the ship in the front, and I think after the signal is hauled down, the ship should put her helm over to the ship on the right to keep clear of the ship on the left; that is, in turning to port and in turning to starboard, the ship on the port should keep clear of the ship on the starboard. The ship should always pass the ship ahead on the starboard helm (× meeting ×, and *vice versâ*). Take the "Thunderer;" they cannot turn inwards within three cables' length, and Captain Fremantle says they go a cable and a half before they have formed the angle of 90°.[1] I congratulate Captain Fremantle upon his Essay. I think his ideal action is most perfect. For myself, if I were afloat, I should much prefer being in one of the smaller ships instead of one of the long ships. I believe the strength of a chain is its weakest part, and the weakest steering ship and the slowest ship are detrimental to the others, and the others will have to protect them, the long ships, from being rammed. With regard to torpedo-boats not living at sea, I have been nine months in an open boat on the coast of Africa, and have ridden out several tornadoes. I do not think there is any sea going that a first class torpedo-boat would not survive in, and I would sooner be in a gunboat than in one of the ironclads.

Lieutenant A. H. DUNCAN, R.N.: I wish just to refer to the point mentioned by Captain Wilson. In the essay Captain Fremantle appears not to think much of the torpedo in naval action. If a ship is longer than her adversary I should think it would be advisable to use outrigger torpedoes to protect her from the ram, but I do not think the torpedo should be used if a ship depends upon her manœuvring powers, because it will sensibly retard her progress; but if a ship finds she is close to an adversary of better manœuvring power and greater speed, she ought to use the torpedo as an auxiliary for the purpose of defence. It may not be exactly within the scope of this discussion, but I noticed on reading the essay that Captain Fremantle does not appear to attach any importance to porcupine drill; he thinks it useless. But if you are attacking an enemy's harbour, and are lying at night within range of a torpedo-boat and using your own boats for the purpose of clearing the channel, then it appears to me there is only one method of protecting your ship, and that is by nets and spars round her. Of course the whole question is in its infancy, and the net is a great incumbrance to a ship, but there have been many suggestions for pro-

[1] Not safe for two ships to turn inwards at once under four cables.

tecting a ship at less inconvenience, some very practical, which may soon be introduced. I think no Commander would allow his ship to be protected by guard boats alone after the experiments we have seen carried out in different places by our fleet. Captain Fremantle spoke a good deal of distance.[1] The probability is that the distance-angle would be taken by junior Officers who cannot be expected in action to be as cool and collected as older men, and consequently, with a delicate instrument like the sextant, there is a very great chance of a mistake being made which will throw the whole fire of the guns out.[2]

The CHAIRMAN: Do you think you could read a sextant in a battle?

Lieutenant DUNCAN: I think you would be liable to make a mistake, and thereby throw the whole fire of your guns away.

The CHAIRMAN: I think we may now consider the discussion ended. I believe it is the privilege of the Chairman to offer a few remarks, and I commence those remarks by thanking the different Officers who have addressed the meeting to-day. As Captain Dawson has said, we have heard some very useful and practical observations from Officers on full-pay and in the active list. I think both the relatives of Captain Fremantle, as well as the Referees, must be pleased to find that the choice of the essay has not been challenged, whilst all appear to think highly of those which have been honourably mentioned. I listened with interest to Captain Wilson, who, as I understand, approves much of broadside electric firing, and I should quite agree with him about firing the first broadside by electricity if he would ensure me a cool man to fire it. He tells us that he is going to select the best man in the ship. Yes, but until we go into action we do not know who is the best man. If we had a war to-morrow the Officer whom we think lightly of now, might prove to be the most efficient. I think nearly everyone who has spoken, except Captain Wilson, disapproves of electric firing. The labour and expense incurred in fitting the electric broadsides is very great, and if it is not accepted by the Service as a first-rate system that expense should cease. I am very glad that Admiral Randolph takes such a strong view on the subject; as he is a well-known practical Officer his opinion will carry great weight.

Captain WILSON: With regard to the question of expense I may say I fitted one ship at my own expense for the sum of 8*l.* 1*s.* 6*d.*

The CHAIRMAN: I do think with regard to the torpedoes we should impress great caution upon junior Officers. The whole subject is quite in its infancy. For defence there can be no doubt as to the value of torpedoes, but as regards offence we are still in the dark. We should therefore be cautious how we take up these questions. We hastily adopted the Harvey torpedo, which by the light of the present day is considered absolutely childish. Commander Noel alluded to a very important subject, namely, the conning towers. My own opinion is, a commanding Officer must have very great moral courage to shut himself up in a conning tower when in action. The use of gunboats for the purpose of practising our Officers in manœuvring is really essential. It is a principle that was advocated years ago, and yet nothing has been done. I should like to ask Admiral Ryder what tide there was in the neighbourhood of Cronstadt, because I do not think you could carry on the experiments in the bold way he spoke of, in a strong tideway. I can conceive no better place than the harbour of Portland for exercising gunboats in ramming tactics; and if the gunboat is lost, instead of trying the unfortunate young commanding Officer by court martial I believe the idea of the Admiral asking him to dinner is about the very best thing. My opinion is strongly in favour of line ahead. I consider (as Captain Fremantle says) that the Signal Book is to teach Officers to handle their ships, and for that reason only I recommend rectangular movements. They will never be carried out in action. With regard to ramming there is no doubt that, theory apart, what is wanted is nerve and a good digestion, and that I believe will be found a most important point if ever we come to real war. An Officer must have a good deal of nerve to ram a ship when he knows that of a certainty his enemy will be destroyed,

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[1] The distance from the enemy's ship at which the helm is put over in order to ram—also the distance at which the guns are fired.

[2] And possibly give the enemy an opportunity of making a successful ram.

and he most likely will come to grief himself. I do not believe one man in ten would have the moral courage to run into another ship in the open sea.

Lord COTTESLOE: Will you allow a stranger to address one of your meetings? As several distinguished Officers, including yourself, have been kind enough to advert to the presence of myself and other relatives of the writer of the Prize Essay I think I ought not to allow the meeting to disperse without offering my thanks to the meeting for your kind notice of us, and the flattering manner in which my son's essay has been received. I do not pretend to discuss any part of the subject which has claimed your attention. I should have very great difficulty in even understanding a great deal of it, or of what has been said, but I do feel very thankful to you and to this Institution for the honour you have done him by awarding him the Gold Medal. I feel also very thankful for the flattering and considerate manner in which the Officers who have taken part in this discussion have criticised his work. I am quite sure that it is open to criticism. I know that upon all professional questions as doctors differ, so naval Officers will also differ, and I am gratified to find there is so little ground for finding fault with this essay. I thank you very much personally for the kind manner in which you spoke of members of my family who have been connected with this profession. When I recollect that my father was a distinguished naval Officer—the friend and companion of Lord Nelson—that three of my brothers have died in the Service, and that I have a son now in command of an ironclad in the Mediterranean squadron, and a grandson who I hope will very soon be admitted into the profession, I feel almost ashamed that I was not brought up to the same calling. I will not, however, make any further reference to myself, but assure you that I am very thankful to you for the compliment you have paid us.

ON TORPEDO-BOAT TACTICS.

Translated from the *Mittheilungen aus dem Gebiete des See-wesens.* (Vol. vii. No. 4.)

By Thomas Brassey, Esq., M.P., &c., &c.

We are informed that the Russian Navy was supplied with no less than 120 torpedo-boats in the course of last year.

To train the crews, and establish a definite system of torpedo tactics, 12 of these boats were kept in commission last summer; and thus the commanders who had completed the greater portion of the torpedo courses, as well as the crews, had an opportunity of making themselves familiar with the method of handling these boats, and with the system of torpedo manœuvres generally.

The experiences acquired in the course of the commission have been brought together by Lieutenant Witheft. They were discussed at a conference of Officers belonging to the Torpedo School and the Navy generally, and they are epitomised in the following paper.

Torpedoes were employed most extensively in the American War, and no less than 40 ships were destroyed. The greater number of these ships were blown up by defensive torpedoes, and only a small proportion by the offensive torpedo.

The conditions of torpedo warfare remained unchanged, until the successful results of offensive operations in the Russo-Turkish War encouraged the Russian Government to order the large flotilla of torpedo-boats already referred to. It was in that war that the aggressive torpedo, in the hands of adventurous and daring men, was shown to be a weapon capable of being used with the most deadly and decisive effect, and, after a certain amount of successful practice in the management of these small craft, it clearly appeared that they could be employed as aggressive weapons, with much less risk than might have been inferred from the results of the earlier attempts, which had been made in America.

To ensure success, you require a good *matériel*, and the boats must be managed by men trained to the peculiar and hazardous service which they will be called upon to undertake. Every division of torpedo-boats should be instructed how to conduct an attack with every prospect of success, without the support or co-operation of any other naval arm. In the recent Russo-Turkish War, nine attacks in all were made with torpedo-boats; viz.:—

1, by Dubasoff and Schestakoff, on the Danube; 2, in the roadstead of Batoum; 3, by Skridloff, on the Danube; 4, by Niloff, on the Danube; 5, by Puschtschni, Zatzarennyi, and Roschdestrocuskyi, at

the Sulina mouth; 6, in the roadstead of Soukoum-Kalé by Zatzarennyi, Pisarewskyi, and Wischnewetskyi; 7, in the roadstead of Batoum, by Zatzarennyi and Schtschetinskyi. The remaining attack was conducted by submarine mines in the Sulina mouth of the Danube.

When we come to examine the incidents of each of these attempts, which were attended with a greater or less measure of success, without entering upon a general criticism of the campaign, it will be remarked that every attack was successful when undertaken according to a well-matured plan by a group of torpedo-boats; and that no attack succeeded which was made by a single boat. As an illustration, we may point to the attack made by Dubasoff and Schestakoff on the Turkish monitor, to the attack made by the boats of the "Constantine" in the roadstead of Soukoum, and to the attack on the guard-ship at Batoum, by the boats of the "Constantine," with the Whitehead torpedo. All the other attacks were unsuccessful, including the solitary attacks by Skridloff and Niloff, as well as the attacks, which were undertaken indeed by a group, but in which one of the boats—owing to undue precipitation—made an attack unsupported. Thus it happened in the first expedition against Batoum, and in the attacks at the Sulina mouth.

When we turn to the equipment of the torpedo-boat, the first and most essential point is, that the torpedo and the torpedo-boat should, so to speak, form one single weapon, so that the attention of the commander may never be divided between the conduct of the boat and the handling of the torpedo.

A second essential is, that the arrangements should be such as to secure the instantaneous explosion of the torpedo, without the chance of a miss-fire.

These two conditions apply more to the case of the torpedoes which are fired automatically, or by electricity. There must be a double set of conductors for the electric fluid, and the igniting apparatus must act upon receiving a slight blow. The equipment of the spar torpedo requires that all the gear should be exposed. This is not the case with the Whitehead.

To hit a target of the size of a ship with the spar torpedo demands no peculiar dexterity, although the attack often fails from the colliding of the boats engaged. On the other hand, the success of the attack is certain if the blow has been dealt home. The assailant knows precisely what is taking place, and the fate of his adversary is decided before his eyes.

There are not many advocates for the towing torpedo. As a means of attacking ships, which are protected by barricades or other obstructions (and we must expect hereafter to have to deal with obstructions of that nature), this torpedo must be reckoned as altogether ineffective. Again, there is great risk that the tow line will foul the propeller, as happened in the case of the boats of the "Constantine" on two occasions.

Opinions are generally in favour of fitting boats with spars carried on the side. Although this method has been definitively adopted, it

may not be superfluous to state the reasons why torpedoes so fitted have been found useless on certain occasions.

The advocates of the towing torpedo insist on the facility with which the enemy may be attacked on the broadside, without slackening speed on the part of the assailant. Such an attack is almost free from danger to the assailant; but it does no injury to an enemy protected by obstructions. The harmless explosions will only steel his courage, and accustom him to await calmly all future attacks.

The attack with the spar torpedo presents some points of difficulty. The boat may be too far from, or perhaps some feet too near the enemy's ship. In the former case, the automatic explosion inflicts little damage; while in the second case, that, namely, when the boat is too near, and the spars cannot be extended to their full length, it may happen that the explosion may cause damage to the boat itself.

These are the grounds on which the use of the spar torpedo on the broadside does not altogether commend itself.

It is usual to supply torpedo-boats with drifting torpedoes. In order to use them, it is necessary to place the torpedo-boat in the path of the enemy's ship, the impact of which causes the torpedo to explode. The chief defect of this description of torpedoes consists in this, that they explode not under the ship, but at the water line. Hence, if the ship be protected by nets or other obstructions, the torpedo can inflict no injury. The ship can only be struck when several torpedoes are fired in succession, and an opening is thus made in the obstructions. Even in this case, however, success is far from certain. In addition to this, where there is an ebb and flow of tide, the drifting torpedo is as dangerous to your own ships as to those of the enemy; and at night more particularly it is impossible to get out of its way. Drifting torpedoes are therefore to be used by the torpedo flotilla only in cases where the attack is being undertaken according to a plan laid down beforehand, with sufficient accuracy, and it can be known to every man taking part in the expedition where and when the torpedo is to be used. Having recognised these two important defects, it may be inferred that these torpedoes are chiefly valuable as a means of destroying the *morâle* of the enemy, and fettering his movements by the apprehension that he may possibly encounter one of these weapons every time his ship is brought to a standstill. As an engine of destruction, these torpedoes cannot yet be accepted as practically effective.

From this general view of the *matériel* of torpedo warfare we turn to the tactics to be employed in the use of these weapons.

It has already been observed that an isolated attack with torpedo-boats must only be attempted in exceptional circumstances.

It must be assumed that the vessel which it is proposed to attack is protected with nets or floating obstructions. If a division of torpedo-boats is available for the proposed attack, it will be desirable to break up the division into three groups, to each of which a special duty will be assigned. Further, each boat in the several groups must confine

itself to the special task which has been assigned to it. Assuming that the enemy is effectually protected by obstructions, nets, or other barriers, the first group is required to remove them.

The second group makes the attack.

The third group is held in reserve. Their task consists in rendering help and filling up any losses caused in the two leading groups by the defence of the enemy.

As soon as each group has been completed, and their precise duties have been assigned to them, the operations must be carried out according to a well-considered and well-defined plan.

The torpedo-boats of the first or pioneer group, and those of the second or attacking group, will proceed in double column. The reserve boats will follow in rear.

The pioneer group after their task has been completed will fall back into the reserve. The attack must be made simultaneously by the boats of the attacking group. The speed of all the boats must be regulated by the speed of the slowest boat.

The commandant of the division, who must take his place in one of the boats of the reserve division, gives the signal for the attack.

The highest speed of the slowest boat should be made the maximum speed as long as possible, so as to ensure that each boat shall come up to the attack at the right time. The farthest stations will be assigned to the slowest boats, so that all may come up with the enemy simultaneously. The engines should be slowed at some fathoms distance, and should be reduced to half-speed when about twelve fathoms from the object. By adopting these dispositions it is possible for the commandant of the boats to satisfy himself that his own spar, with the torpedo attached to it, remains uninjured up to the last moment before the blow is delivered, that it is clear of the spars rigged out from the other boats in the group, and that the electrical firing gear is in order. It is to be observed that the risk of injury to the electrical explosive apparatus is not so great as when submerged spars are used.

The electrical firing gear should only be used when the automatic gear fails, as may readily happen when the distance has been misjudged and the torpedo has been fired too far from the object.

The torpedo should be brought under the ship's bottom. If the Whitehead torpedo is used, care should be taken not to aim at a vessel amidships, for there the armour is carried down to a considerable depth under water. A spar torpedo will in case of necessity be used against a perpendicular broadside.

The effect of the explosion, owing to the torpedo striking at an acute angle, will in most cases be greater in proportion as the centre of the charge is brought closer to the ship's side.

From what has been said it will be obvious that, in order to ensure a successful result, the attack should be made from at least four points before or abaft the beam, whether on the port or the starboard side. For such an attack there will be required four pioneer boats, to clear away the obstructions round the ship, four boats to make the attack, two boats in reserve, and one for the commander of the division—in all eleven boats.

Even supposing the newest type of torpedo-boat to possess contrivances for closing all apertures simultaneously, experience proves that Officers, as well as men, prefer to make the attack with open hatches, a circumstance which would probably be the cause of some loss of life. This can, however, scarcely be a point of serious importance, since a torpedo-boat with a speed of 10 knots would only require 4·8 minutes to pass over a distance of 1,500 metres exposed to the enemy's fire. The prospect of great loss of life would delay, or even entirely defer, an attack, although in former times many boat expeditions and boarding attacks, requiring much more determination, and involving the probable loss of many lives, have been carried out successfully. The attack by torpedo-boats is, in fact, a kind of boarding attack, under far more favourable conditions for the attacking party than in the old days, the cutlass, the boarding-pike, and the tomahawk having been supplanted by electric and automatic firing apparatus.

If only five of the eleven torpedo-boats sent forth on an expedition return uninjured, they will have succeeded in their task; the other six will only have performed their duty, and their loss will be fully repaid by the destruction of the enemy's ship.

The results of the attacks by torpedo-boats in the course of the late war, which latterly were carried on almost without any loss on the part of the assailants, cannot be regarded as very considerable. In the future we shall probably have to deal with enemies more determined and alert, and a more serious loss in men and *matériel* must be anticipated.

When a boat is destroyed, in the attack it does not necessarily follow that the crew should lose their lives. The attack must be made stealthily, so as not to attract the attention of the enemy. This will not be so easy in the future as in the last Russo-Turkish War, although it is true that in that war, boats of a speed of from six to eight knots were used, while the new boats will make their attack at a speed of thirteen knots.

It is difficult to give any positive opinion as to whether it is best to make an attack in broad daylight. In very dark, stormy nights, the enemy will generally be more watchful. A single ship can scarcely be defended effectually, even in the daytime, against a flotilla of torpedo-boats. Our present experience scarcely enables us to say whether the attacks in the day or those in the night have the best chance of success, even assuming that there may be greater loss of life in the former. It may happen that you find an enemy who, having observed a division of torpedo-boats coming down upon him, has made every preparation to repel their attack. But it does not follow that he may be able to make an effective defence. Here it would seem that the chances of success are greater in a daylight attack. A ship attacked in the night can make use of the electric light. The assailant should endeavour, so long as it is possible to keep out of sight; thus, for this purpose, the torpedo-boats should be painted of such a colour as may be least conspicuous under the electric light. The usual dark gray colours are conspicuous, inasmuch as they appear much lighter, and indeed become a pure white, when seen under the electric light. Experiments in the

Black Sea showed that a light brown or chocolate colour was the least conspicuous colour.

It is to be remarked that no special code of signals has yet been devised for torpedo-boats. In the absence of these, two boats belonging to the same fleet may possibly attack one another.

The equipment of torpedo-boats with machine guns deserves very careful consideration. It is still difficult to pronounce an opinion as to their suitability.

In making an attack it will be impossible to open fire with these weapons. They can only be employed with effect against boats, or to cover a retreat. The pyroxiline rockets may be found more useful. They have been supplied to torpedo-boats. They do not load them too deeply, take up little room, and can be used with equal advantage for signalling purposes both in advancing to the attack and in retiring. The explosion of these rockets on board the ship which is attacked would create no small confusion.

The general conclusions to which we have been led by the foregoing observations on attacks by torpedo-boats, may be summed up as follows:—

1. Attacks by single boats are only to be attempted as a last resource.
2. The attack must be made according to a carefully considered plan.
3. The torpedo-boats are to be equipped either with the Whitehead or the spar torpedo.
4. A squadron of torpedo-boats must be divided into groups, the "pioneer" group, the "assaulting" group, and the "reserve" group.
5. The torpedo should be fired automatically, and only when this plan fails, should the electrical firing apparatus be employed.
6. The spar should be sunk as soon as the boat is reduced to half-speed or stopped. At full speed the spar should be triced up clear of the water.
7. The attack should be made, at a signal from the commander, simultaneously from several points.
8. The speed of the torpedo-boats before the attack, until they reach the positions which have been assigned to them, should be regulated according to the speed of the slowest boat.
9. The commander of the division should remain in the rear, with the boats of the reserve group.
10. The torpedo must be brought into contact with the bottom or unarmoured ends of the ship.

In order to be able to apply all these rules effectually in war, it is necessary in time of peace to train every torpedo division to apply them, as far as possible, under the conditions which would arise in actual warfare. This would be easily effected if the manœuvres of an attack were put in practice, according to a predetermined plan, against a fleet at anchor and under way, intelligently, with dummy torpedoes. At the end of the course of instruction, an attack might be made as a test of the efficiency which had been attained with loaded torpedoes against a raft or pontoon towed.

It is only after considerable practice that success can be obtained in this new method of warfare. Trials with single boats can only be regarded as a preliminary to manœuvres with a complete division of boats. They in no way ensure success when a boat is for the first time attached to a division, without having been exercised in making attacks of a similar nature in time of peace.

MILITARY TRANSPORT REQUIRED FOR RAPID MOVEMENTS, ESPECIALLY IN INDIA.[1]

By Major A. R. Heyland, 1st Bombay Light Cavalry.

It appears that what is needed for the above is a species of transport which, to be thoroughly efficient, should be—

Easily raised on an emergency, and capable of being quickly set in working order; also of expansion as to numbers of vehicles and animals on requirements increasing.

When raised, easily kept going without a large staff of Transport Officers.

Capable of rapid progression, equal to if not superior to that of the troops which it accompanies.

The animals belonging to it should be of the hardiest obtainable, requiring small bulk of easily procurable fodder to sustain them in hard-working condition.

The vehicles of the simplest and lightest description consistent with strength, each one being easily pulled or pushed with its load rapidly by men in case of the animal in the shafts breaking down.

Harness of a style equally suited to pack as well as to draught, so that, in case of a break-down of a vehicle, the beast drawing it may be used as a pack animal; or that, in case of insufficient animals or vehicles for the baggage and ambulance, some of the animals may be used for pack and the vehicles as hand barrows, pulled or pushed by coolies or soldiers; or, again, in case of detachments which have to march with their baggage by mountain paths, where even light carts and field artillery cannot travel, the required number of pack animals may be used for this purpose, and the vehicles wheeled round by hand by better roads, or taken to pieces and carried over difficult places.

The vehicles should be capable of being easily and quickly taken to pieces and put together again for facility in stowage and transport, in a small compass, by ship or rail, or for carriage on coolies' heads.

A proportion of the best baggage animals with a force should be capable of drawing their carts at a gallop, carrying each four infantry men, with their arms and ammunition, to desirable points at critical moments, or of carrying reserved ammunition rapidly where and when required.

Vehicles and harness should be easily made and easily repaired when broken, by unskilled native workmen.

So as to diminish, as far as possible, the weight to be carried,[2] the vehicles should be so constructed that they or parts of them may, if

[1] Read at the Evening Meeting, April 19, 1880, Colonel E. H. Clive, Grenadier Guards, in the Chair.

[2] This must be particularly remembered with reference to number of vehicles and the length of the line of carts and animals to be guarded on the march.

necessary, be put to other uses besides that of carts or hand barrows; for instance, the platform of the cart may be made so as to be easily and quickly separated from the body of the cart for use as a hand-litter in distributing ammunition or for carrying wounded men, and the cart itself, carrying a small roll of canvas, from 30 to 40 lbs. weight, may be quickly converted into a comfortable tent.

Lastly, the raising and keeping up of the whole should be as economical as can be, consistently with as many of the above conditions as possible.

The description of transport which is best suited to meet these requirements in India seems to be—

Small and very light carts, made principally of bamboo and coir rope (until a better material is suggested).[1]	Drawn by— mules, donkeys, ponies } Not less than 12-2 and not more than 13-2 in height. Geldings and mares should only be employed, for obvious reasons.

Such carts have been tried by me at different times for some years past, on the line of march and on shooting trips, and a pattern has been constructed by me with improvements by Mr. Rowe which possesses most of the advantages mentioned as desirable, and an inspection of this cart, real practical trials of its use, and expressions of opinions from those who consider the matter worthy of notice, may lead to good result.

[1] Gas piping has been proposed, and I believe used, by Mr. Rowe, Superintendent, Municipal Workshops, Bombay, as a substitute for bamboo in making up some of my pattern carts taken lately by Officers of the 7th Fusiliers on service.

A pattern cart may be seen at the Municipal Workshops, Bombay.

It is made of bamboo and coir rope.

It weighs 185 lbs. complete.

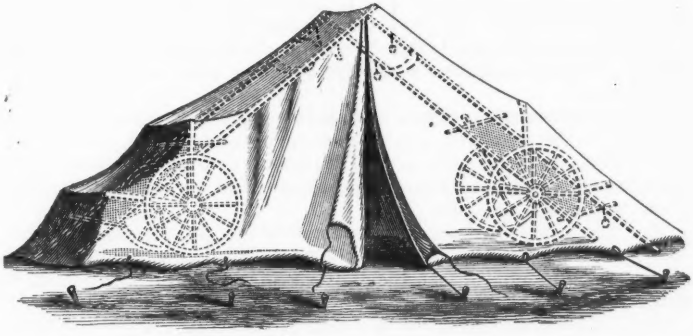
To make, it costs in the Municipal Workshops, Bombay (fitted with the best wheels and axle), about 45 Rs. complete: with country wheels, in the Deesa Bazaar, about 30 Rs.

When drawn by an ordinary 12-hand or 12-2 pony, it carries easily at three to four miles an hour on ordinary roads from 400 to 700 lbs. weight of baggage.

It carries canvas (three folds thick, weight about 40 lbs.), with which a cart can be made into a fair, small tent; two or four carts opposite each other with their canvas form a large one, or with the carts in two rows facing each other, any length desired.

The whole cart can be taken to pieces and tied in a small bundle, either to be carried by coolies or for stowage in a railway carriage or on board ship.

It can easily be put together again; the component parts of several carts are interchangeable without inconvenience.



The platform can be taken off at once to form a hand litter.

The harness consists of the ordinary Commissariat mule pack saddle (of course made smaller and lighter for small ponies and donkeys), with belly-band, breast-band, breeching and crupper.

Head-stall and leading tape, *no bit*, the animal in the shafts being quite under control with a metal nose-band, to which the tape is fastened.

There being no traces, to the ends of the shafts is fastened a broad leather band lined with numdah as a breast-band, supplementary to and over the pack saddle breast-band and kept in its place by a leather strap going over the neck of the animal.

On emergencies, the pony or donkey can be used as a pack animal without extra harness.

The pack is of itself a great protection to the animal from cold, sun, and rain, and can be used during day and night instead of a jhool.

The iron nose-band, in place of a bit, will more easily admit of one man looking after several carts, each pony being fastened by his leading tape to the cart in front of him.

With a bit, the jerks which would certainly frequently occur on the march would probably hurt the pony and make him resist and fall back, but with the nose-band this would not be likely to occur; the animal would be happier and work better without a bit (horses and mules in the shafts of carts in many countries never have bits in their mouths).

Remarks.

The carts being part of the tent, great celerity may be looked for in striking camp. The animals belonging to the carts should be picketed close to their respective carts, and there appears no reason why a force encamped with them during the darkest night should not be ready to march with all its baggage within ten minutes of receiving the order to strike tents and pack baggage.

The carts with ponies being capable of rapid movement, it would be feasible for a force provided with them to move in an enemy's country actually unaccompanied by its baggage, doing away with the necessity of providing for baggage guards and separate escorts, and the carts with their loads might at times offer valuable shelter from an enemy's rifle bullets.[1]

It is unnecessary to remark that such very light carts are not suited for carrying heavy chests, but all impedimenta required by troops for actual business in the presence of an enemy can be easily carried by them, such as light tents, kit bags, ammunition, rations, intrenching tools, water bags, &c., &c.

The cart has no springs, but owing to the elastic material of which it is composed, it can be used conveniently for carriage of the sick; for wounded men the platform would be of course used as a litter carried by coolies.

It is a well recognised fact that a large percentage of pack animals on service are generally useless when their services are most urgently required, from galls and sore backs; with the harness and light cart suggested, sore back and galls should be almost impossible.

The only advantage for purposes of military transport which pack animals have over wheeled vehicles and draught animals, is that on rare occasions pack animals may go where wheels cannot, but the style of cart which is recommended to be used can be wheeled with its load in nearly all places that a laden camel can go, and in many places where a laden camel cannot; moreover, by the combination-harness for both pack and draught purposes, and the portability of the cart, the only objection to wheeled transport is at any rate partly removed;

[1] I could give many instances in which this use could have been made of light carts for approaching in the open, positions otherwise unassailable, without great loss to the attacking party—a loss completely disproportionate to the object to be gained—by loading these hand barrows with tents or bags, excellent easily and quickly movable mantelets can be extemporised.

on the other hand the advantages of wheeled over pack animal transport are too numerous and well known to require comment.

Small mules, ponies, and donkeys are the hardiest slaves we have in India, and require much smaller bulk of food than camels, bullocks, or horses, both as regards the animals themselves individually, and as considered with reference to power obtained for the required purpose. Costing next to nothing to their owners to breed, they can be obtained in sufficient quantities at small cost whenever required throughout India, without Government assistance until the moment when it is required to entertain them.

Spare bamboos to repair broken carts could be carried easily, one long and one short by each cart, and should be braced to a corresponding length of bamboo in the cart itself with leather thongs so as to be out of the way until required.

All who have tried it know the constant worry to men and animals entailed by the use of pack animals, loads difficult to balance, to fasten on, and when on, constantly slipping to one side or off altogether; with light carts bundles and bags can be distributed evenly, quickly, and without trouble over the cart, and the whole safely secured by one long rope drawn through iron rings attached to the sides of the platform and over the load as often as necessary, whether diagonally, crossways, or lengthways. The platform of the cart being of rope, can be slackened or braced up as tight as necessary, according to the sort of load which is to be carried.

In pitching the tent, should rain be expected, care should be taken by hauling out the canvas to the pegs to permit it only to come in contact with the cart at the highest point, viz., the top of the shafts where leather caps are sewn on to the canvas, as in all tops of pole tents.

The reverse ends of the cart may either be fastened to pegs in the ground, or buried in the ground themselves, so as to increase or decrease the slope of the tent as required.

It is perhaps superfluous to add that without power of rapid movement, accompanied by their tents, food, and ammunition, the best troops in the world, armed with the best weapons and commanded by the best Officers, are for offence no better, nay even not so good, as the most irregular and primitively armed troops possessing greater mobility. Is this fact recognised generally, and if so, is it ever forgotten?

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Wood, Edward A., Lieut.-Colonel 10th Hussars.
Bibby, Alfred, Captain 7th Dragoon Guards.
Brown, Edgar Cubitt, Lieut. 89th Regiment.
Brand, T. S., Commander R.N.
Baynes, Gilbert S., Lieut. 60th Rifles.
Trent, H. W. J., Colonel, late 68th Regiment, Inspector-General of Musketry.
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Jeffreys, P. D., Captain 88th Regiment.
Davidson, Stuart, Lieut. Royal Engineers.
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Macleane, Thomas, Captain h.p. late 101st Regiment.

OCCASIONAL PAPERS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications or books for review may be addressed to Lieut.-Colonel Lonsdale Hale, at the Royal United Service Institution, Whitehall Yard, London, S.W.

HOW TO CREATE AND MAINTAIN EFFICIENT A SHORT SERVICE ARMY.[1]

In No. 99 of this Journal we recommended anyone who wished to find the key to the solution of this problem, to peruse the Report, by Colonel Kaulbars, on the German Army. The first edition of the French translation of the Report was soon exhausted. A second edition, carefully revised and condensed, has just been published, and we tender therefore, in the forefront of the Occasional Notes, the advice to the members of the Institution to obtain a copy of the book, and learn from its pages how the difficulties inherent to a system of short service are overcome.

THE RAILWAYS OF FRANCE AND GERMANY, CONSIDERED WITH REFERENCE TO THE CONCENTRATION OF ARMIES ON THE FRANCO-GERMAN FRONTIER.[2]

By Captain G. Macdonald, R.E.

Ten years ago the idea of an invasion of their country scarcely seemed to have been entertained by French military writers; the subject was certainly not discussed in their published works. Now, on the other hand, they seem to generally take it for granted that in the event of a fresh war with Germany, their own armies could not be so rapidly assembled on the frontier as those of their opponents, and that they would, therefore, in the first instance at least, necessarily have to act on the defensive. The greater

[1] "Rapport sur l'Armée Allemande," par le Colonel Baron Kaulbars. Traduit du Russe par G. Le Marchand, Capitaine d'Artillerie. Nouvelle edition, revue et corrigée. Paris, 1880. Librarie Militaire de J. Dumaine, Rue et Passage Dauphine 30. Size, 7" × 4½" × 1¼". Pp. 431. Weight, 1 lb. 2 oz. Price 5 francs.

[2] "Les Chemins de Fer Allemands et les Chemins de Fer Français, au point de "vue de la Concentration des Armées." Paris: Dumaine.

rapidity in concentration of the German over the French Armies is assigned to two causes :—

Firstly. To the superiority in mobilization still undoubtedly maintained by Germany, notwithstanding the efforts which have been devoted to the reorganization of the French Army.

Secondly. To the greater facilities afforded by the railways of Germany over those of France for a concentration of troops on the Franco-German frontier. Since the war of 1870–71, large sums have been expended in both countries in improving railway communication, but the superiority of the German railways over the French, which was then very evident, is still maintained. This superiority seems to consist in four points :—

1. Germany possesses a greater number of railways available for the concentration of troops on the frontier than does France.

2. In Germany these lines run nearly parallel, connecting the frontier with the various provinces of the Empire, whereas most of the main French lines converge from the frontier on Paris.

3. The lateral railway communications are better in the German than in the French frontier provinces.

4. German rolling stock is better adapted to military purposes than French.

In one respect only is the French military system superior to the German, viz., that nearly the whole of the French railways are in the hands of six great companies, which could easily be brought to act in concert in a case of national emergency. The railways of Germany, on the other hand, are under sixty-seven different Railway Boards, many of which have competing interests ; and the German Head-quarter Staff has, naturally, a very complicated and difficult task in arranging for the harmonious working of all these units in the event of war. But this evil is now in process of removal. In December last a Bill was passed by the German Landtag, confirming the purchase by the State of four private railways, and the course thus entered upon will doubtless be followed until all the main lines of railway, at least, are in the hands of the Government.

A series of articles which appeared a few months ago in the "Journal des "Sciences Militaires," and have been republished in the form of a pamphlet, discuss the facilities afforded by the German railways for concentration on the frontier with a view to the invasion of France, and the additions necessary to the French railway system to enable a prompt resistance to be offered to such invasion.

We propose to give a *résumé* of the writer's views, but it may render these more clear, if, in the first instance, a brief description be given of the modern Franco-German frontier, and of the obstacles which it presents to a German invasion.

The Franco-German Frontier.

The northern part of the frontier line, which traverses the old French province of Lorraine, was decided by political considerations and is not defined by well marked geographical features. The southern portion follows the crest-line of the Vosges mountains, and from their southern extremity is carried across the gap of Belfort to the Swiss frontier.

Of the territory adjoining the frontier line on the French side, Lorraine is the only probable theatre of extensive military operations ; for the Vosges district is unsuited to the movements of large bodies of troops, while the gap of Belfort is closed by French fortifications. The frontier line abuts on the south on Switzerland and on the north on Belgium and Luxemburg, the neutrality of all of which territories is guaranteed by the Great Powers of Europe. The situation and geographical formation of the first-named country seem to render any violation of its neutrality hardly probable, although both the French and the Swiss Governments now seem to entertain such a contingency

as not impossible, and to be disposed to take steps to meet it. But with regard to Belgium and Luxemburg the case is different, and French military writers seem to take it for granted that in the event of a new Franco-German War, the guaranteed neutrality of these territories would not be permitted by the invaders to stand in the way of the advantages presented by a movement from Cologne on Rheims and Paris. This apprehension does not, however, appear to be shared by the heads of the French General Staff, for the improvement of the fortifications of two important points on the Franco-Belgian frontier (the railway junctions of Mézières and Montmédy), though at one time contemplated, has not yet been commenced. In fact, little seems to have been done to strengthen the north-eastern frontier with the exception of works at Hirson to bar the Charleroi-Laon Railway, and of additions to the old fortress of Maubeuge.

The remainder of the boundary, however, has received more attention, for a defensive line has been established, running from Verdun up the Meuse, crossing over to the Moselle valley at Toul, following the Moselle valley from Toul upwards, and from it extending to the Swiss frontier. The main points of the northern portion of this line are the fortresses of Verdun, Toul, and Epinal, which command the passages of the rivers on which they are situated and are now surrounded by detached forts. A line of permanent works also, placed at a distance of three to five miles apart, extends on both sides of Toul from St. Mihiel on the Meuse to Pont-St.-Vincent on the Moselle, a distance of thirty-two miles. In the space left unfortified between Verdun and St. Mihiel, the mountainous and wooded region of the Argonnes is an obstacle to the movements of large bodies of troops, while the gap between Pont-St.-Vincent and Epinal would probably be directly defended by a French army occupying the advantageous positions which occur along the Moselle and on the left bank of the Madon. In addition, the railways leading from German Lorraine into France have been barred by fortifications at the important junction of Frouard, at Etain on the Verdun-Metz line, and between Luneville and Avricourt.

From Epinal to the Ballon de Servance the defensive line follows the course of the Moselle, and powerful forts have been constructed at Arches, Remiremont, Thillot, and St. Maurice to guard the four avenues by which it might be approached from the eastward.

Further south, the railways and roads leading from Upper Alsace into France through the gap of Belfort are closed by that fortress, which has lately been considerably strengthened, and by forts at Montbéliard, at Pont-de-Roide, and at Blamont.

Finally, the railway from Neufchâtel to Dijon is barred by fortifications at Salins and Pontarlier, pointing to apprehension of a possible invasion through Switzerland.

We now pass to the consideration of Major X.'s pamphlet.

The Railways of Germany.

The railway lines which run from various parts of the German Empire to the French frontier may be divided into three groups, viz., those of Northern, of Central, and of Southern Germany.

Lines of Concentration of Northern Germany.

These are—

(1.) The railway Liège—Maëstricht—Wenlo—Wesel—Münster—Osnabrück—Bremen—Hamburg—Rendsburg—Flensburg, with branches to the various North Sea ports. Between Liège and Wenlo it lies on Belgian territory.

(2.) The railway Aix-la-Chapelle—Neuss—Ruhrorst or Rheinhausen—Dort-

mund—Hamm—Wunstorf—Hanover—Stendal—Berlin, with branches to Lubeck, Mecklenburg, Stettin, Danzig, and Königsberg.

(3.) The railway Aix-la-Chapelle—Düren—Cologne—Gräfrath—Paderborn—Magdeburg—Berlin.

These three lines permit of a rapid concentration of the North German Army Corps on the line Liège—Aix-la-Chapelle—Düren, to form an Army of the North, which would probably be composed of the Ist Corps (Königsberg), IInd Corps (Stettin), IXth Corps (Altona), Xth Corps (Hanover), and VIIth Corps (Münster).

This Army of the North will, of course, in order to invade France have to violate the neutrality of Belgium; but such a contingency is not to be lost sight of in organizing a system of defence for France. The invading army has the choice of two lines of operation. If no vigorous resistance on the part of the French were anticipated, it might cross the frontier by the gap of Chimay, between Maubeuge and Givet, and push straight on Paris through the richest provinces of France, taking in reverse the defensive lines of the Meuse and the Argonnes.

But it is more probable that the German leaders would adopt the more prudent course, and concentrate their Army in Luxemburg and Southern Belgium, whence it would move westward, crossing the Chiers between Montmédy and Sedan, and the Meuse between Stenay and Sedan.

The right wing of the invading army would be followed by a body of Landwehr troops and garrison artillery, who would proceed to lay siege to the fortresses of Givet and Mézières, with the view of utilizing the railway Namur—Givet—Mézières—Rheims. Givet might indeed be neglected, and the German communications be maintained by way of Charleroi, Marienburg, Vireux.

Lines of Concentration of Central Germany.

1. The new railway Metz — Thionville — Trèves — Coblentz — Wetzlar — Eschwegen—Nordhausen—Zerbst—Potsdam.

2. The railway Metz—Saarbrücken—Kaiserslautern — Neustadt — Mannheim—Frankfort—Hanau—Fulda—Gotha—Leipzig — Dresden — Bautzen — Görlitz—Breslau—Oppeln.

These two railways would probably be used to bring up the Army Corps stationed in Central Germany, viz., the Vth Corps (Posen), Guard and IIIrd Corps (Berlin), IVth Corps (Magdeburg), XIth Corps (Cassel), VIIIth Corps (Coblentz), XIIth Corps (Dresden), and VIth Corps (Breslau), which would form the Army of the Centre, and be concentrated on the line Thionville—Metz.

In addition to the foregoing, a new line of through communication between Metz and Berlin is now being formed by way of Kaiserlautern, Worms, Darmstadt, Gemünden-on-the-Main, Neustadt, Meiningen, Erfurth, Halle, Wittenberg.

Lines of Concentration of Southern Germany.

The following main lines of railway connect the heart of Germany with Upper Alsace :—

1. Basle—Schaffhausen—Ulm—Augsburg—Munich.
2. Basle—Freiburg—Carlsruhe—Heidelberg—Darmstadt—Frankfort.
3. Mühlhausen—Colmar—Strasburg—Mannheim—Mayence.

The two latter have lately been united by three transverse lines, viz. :—

1. Colmar—New Breisach—Freiburg.
2. Mühlhausen—Muhlheim.
3. St. Louis—Leopoldshöhe.

It is therefore quite possible for a German Army to be rapidly thrown into Upper Alsace. But there does not seem to be any great inducement to

do this at the outset of the campaign, and the object of these new railways appears to be only to meet a possible offensive movement by the French from Belfort.

Probably, then, the South German Army Corps, viz., XIIIth (Stuttgard), XIVth (Carlsruhe), XVth (Strasburg), Ist Bavarian (Munich), and IInd Bavarian (Würtzburg), would be concentrated in the region Strasburg, Hagenau, Saarburg, to join a Southern Army or Army of Alsace.

Once assembled on the French frontier, the German Armies would be connected by the following railways, viz. :—

1. Strasburg — Saarburg — Benestroff — Remilly — Metz — Thionville — Longuion—Montmèdy.

2. Strasburg—Hagenau—Saargemünd—Teterchen — Thionville — Luxemburg.

The latter line is not yet completed between Teterchen and Thionville.

In conclusion, the principle followed by the Germans as to their strategical railways is very simple. It consists in multiplying the railways intended to convey their troops to the districts assigned for their concentration, as well as the railways which connect these districts.

The railway works now either planned or in course of execution on the east of the Vosges are a manifest proof of the anxiety of the German Headquarter Staff to perfect to the highest possible degree the means of communication between the provinces of Alsace and Lorraine. Their aim is to be ready before the French, in order to attack and disorganize the armies of the latter before they have completed their concentration. They are fully convinced that in a new war with France, superior rapidity of mobilization and of concentration will be an almost certain guarantee of final success.

If the French desire to save their country from complete and certain ruin, they must imitate their neighbours in this respect, and at any cost organize a system of railway lines connecting their eastern frontier with the most remote parts of France.

Without this, the large sums of money which have been devoted to the fortification of the frontier may prove to have been expended to little purpose.

Proposed Scheme for the Concentration of the French Armies.

We have seen that the German railways permit of the forces of the Empire being rapidly concentrated on the frontier in three great armies, viz., two on the line Arlon—Luxemburg—Thionville—Metz, and the third in the region Saaralbe—Saarburg—Strasburg.

Before proceeding to consider how the concentration of the French forces to meet the threatened invasion might be organized, it is necessary to examine the probable movements of the third German Army, or Army of Alsace.

Its primary object would be the capture of Nancy. After gaining possession of that city, it would probably avoid the fortified line St. Mihiel—Toul—Pont-St.-Vincent, and either move to the north-west in order to join the other German Armies, or else attempt to cross the Moselle above Flavigny with the view of investing Toul and cutting the French communications with the south. Under the latter supposition, it would have to make a direct attack on the line of the Moselle between Flavigny and Chatel (which are twenty-two miles apart), for the fortifications of Pont-St.-Vincent and Epinal render turning movements impracticable.

Evidently, therefore, it is of great importance for the French to be in a position to defend this line, which is naturally of considerable strength. The obvious deduction is—

That a powerful system of railways should be organized, leading from the south-east of France to the region Toul—Neufchâteau—Epinal.

The troops to be brought to this part of the frontier should be those from

the south-east of France, in order to avoid their crossing the lines of concentration of the other corps, which would be assembled to the north of Toul.

The fortified line Pont-St.-Vincent—Toul—St. Mihiel, would be occupied by the garrison of Toul, and by the troops of the 6th Corps (Châlons), which could proceed by road to take up their positions, or, if necessary, might make use of the new railways which terminate between Toul and Verdun.

North of this, however, between St. Mihiel and Dun, the Côtes de Lorraine form a remarkably strong defensive position, which it would be of high importance for the French to occupy before their adversaries.

Further north again, between Dun and Mézières, is the space on which the bulk of the German Armies would probably be directed, and it is here also that the French would attack in the event of their being in a position to assume the offensive.

A very complete railway system is therefore absolutely necessary to enable all the Army Corps of the south-west, west, north-west, and north of France to be concentrated with the utmost rapidity in the region Verdun—Rethel—Mézières.

It appears advisable, then, that there should be two distinct systems of railway lines of concentration. Let us consider them in detail.

1. Lines of Concentration of the Army of the South-East.

This Army would consist of the following corps :—

7th Corps (Besançon).
14th „ (Lyons).
15th „ (Marseilles).
16th „ (Montpellier).
13th „ (Clermont Ferrand).

and its grand depôt would be at Lyons. Its concentration would be effected by two lines of rail.

1st Line of Concentration.—The 7th Corps (Besançon) and the 14th Corps (Lyons) would move to Epinal to form the right wing of the Army by way of Lyons—Bourg—Lons-le-Saulnier—Besançon—Vesoul.

2nd Line of Concentration.—The railway from Marseilles and Montpellier by Lyons to Dijon has lately been extended northwards to Chalindrey, and it will soon be continued to Neufchâteau and Mirecourt. If a short section of railway were formed between Lapalisse and Paray-le-Monial, trains could run from Clermont-Ferrand by Lapalisse, Paray-le-Monial, and Montchanin-les-Mines to join the Lyons—Dijon railway.

The 13th, 15th, and 16th Corps could then be rapidly moved to Neufchâteau or Toul and Mirecourt to form the left and centre of the Army.

2. Lines of Concentration of the Army Corps of the South-West, West, North-West, and North.

3rd Line of Concentration.—The construction of lines of railway between Montluçon and Sainçaise, between Prémery and Nuits-sous-Ravières, between Donjeux and Lerouville, and between Montluçon and Aurillac would permit of the concentration at Dun of the 12th Corps (Limoges),

17th „ (Toulouse),
18th „ (Bordeaux),

by way of Nevers—Prémery—Nuits—Chaumont—St. Mihiel—Verdun.

4th Line of Concentration.—A new railway will have to be constructed to convey the 8th Corps (Bourges) by Cosne, Brignon, Troyes, Vitry to Saint-Ménèhould.

5th Line of Concentration.—If Châlons and Vouziers were connected by railway, the 5th Corps (Orléans) and the 9th Corps (Tours) could travel to Vouziers by way of Pithiviers—Malesherbes—Fontainebleau—Sezanne—Châlons.

6th and 7th Lines of Concentration.—By means of the existing railways Le Mans—Paris—Châlons—Verdun and Rouen—Paris—Soissons, Rheims—Rethel, the 4th Corps (Le Mans) and the 3rd Corps (Rouen), as well as the two cavalry divisions stationed in Paris, would be conveyed to the zone of concentration.

8th Line of Concentration.—A railway will probably soon be laid in the Valley of the Aisne between Compiègne and Soissons. If this were extended to Rethel, and if connections were formed between Dreux and Laloupe, and between Pontoise and Nauple, the 10th Corps (Rennes) and 11th Corps (Nantes) could be carried to Rethel and Mézières *viâ* Laloupe—Dreux—Houdan—Nauple—Poissy—Pontoise—Compiègne—Soissons.

9th Line of Concentration.—The construction of a railway between Laon and Rethel would enable the 2nd Corps (Amiens) to be conveyed to Rethel *viâ* La Fère and Laon.

10th Line of Concentration.—A new line should be formed from Arras to St. Quentin and Rethel to be used by the 1st Corps (Lille).

On the completion of these ten lines France would be as well provided with railway lines of concentration as Germany is at present.

But it is not enough to assemble armies on the frontier; they should also be furnished with easy and direct means of communicating with each other.

Now two transverse lines could readily be organized between the French armies concentrated in the positions already described.

Transverse Lines of Railway.

1st Line.—If railways were constructed from Toul to Mirecourt and from Luxeil to Lure, the French troops on the right bank of the Meuse would be connected with those on the Upper Moselle and with the frontier fortresses by the line Mézières—Verdun—Toul—Mirecourt—Epinal—Luxeil—Lure—Belfort.

2nd Line.—If Rethel, Vouziers, and Revigny were connected by railway, there would be direct communication between the troops in the Valley of the Aisne and those on the Upper Moselle *viâ* Rethel—Vouziers—St. Ménèhould—Revigny—François-le-Petit—Neufchâteau—Mirecourt—Epinal.

The construction of the new lines of railway which we have enumerated is not all that Major X. considers necessary. Many of the existing railways which form part of his proposed system consist of a single line of rails only, and he thinks it indispensable that a second line should be added to them.

Undoubtedly, he concludes, the formation of a system of railways like the foregoing cannot be accomplished in a few months, it must be the work of years; but it is the duty of the French Chambers to demand that a project for some such system shall be drawn up by the Ministers of War and of Public Works, acting in concert, and that such project, once adopted, shall be steadily pushed on to completion. Railways are now constructed with such rapidity that in a few years the proposed system might be an accomplished fact. The French might then rest confident that in the event of war the first battles would not be fought on their territory, and, if the result of these battles were favourable, France would not be entered by hostile troops.

The Defence of the North-Eastern Frontier of France.

In the "Journal des Sciences Militaires," for January, 1880, Major X. proceeds to a further examination of the defence of the north-eastern frontier of France.[1] He assumes that his proposed railway scheme has been carried out; that the Germans, from their superior rapidity of mobilization, would have it in their power to take the initiative; and that the German forces would at the outset be massed on the French frontier in three great bodies, viz. :—

[1] "Etude Stratégique sur la Frontière du Nord-Est."

1. On the line Arlon—Luxemburg—Thionville.
2. On the line Metz—Thionville.
3. In the triangle Hagenau—Saarburg—Strasburg.

To meet the expected attack he considers that the best disposal of the French troops would be as follows :—

1. A great army to occupy the heights on the left bank of the Meuse from Dun to the Rethel—Mézières Railway.
2. A second army on the right bank of the Meuse to occupy the Côtes de Lorraine from Dun to the line Hatton—Châtel.
3. In support of these armies strong reserves to be échelonned at Rethel and Vouziers in the Valley of the Aisne and between Dun and Verdun in the Valley of the Meuse.
4. A third army to be stationed on the Moselle or the Madon between Pont-St.-Vincent and Epinal.
5. Garrison and territorial troops to occupy the fortress of Toul, as well as the intervals in the line of forts which extends from Pont-St.-Vincent to St. Mihiel.
6. If possible, a fourth army or army of reserve, to be posted between Rheims and Châlons, from which' it could readily communicate by railway with the various parts of the front line, and also be in a position to throw itself on the right flank of the German corps in the event of their moving southwards in pursuit of the retreating French armies.

A bridge-head would have to be constructed at Dun, and bridges thrown at various points on the Meuse between Dun and Verdun.

The author then goes on to examine the proper mode of meeting the attack under three hypotheses, viz., its being directed against the centre, the right, or the left of the French line.

1st Case.—Attack on the Centre.

A grand attack might be made by the whole of the German Army of the Moselle and a portion of that of Alsace on the Côtes de Lorraine with the view of crossing the Meuse between Verdun and St. Mihiel, and then passing to the south of the Forest of the Argonnes, thus piercing the centre of the French line.

Such an attack, if successful, would have the effect of separating the French armies, and would enable the Germans to act against them on interior lines. The French troops stationed on the northern part of the Côtes de Lorraine, as well as those on the left bank of the Meuse, would be pressed in front by the German Army of Luxemburg, while their right flank would be threatened by the Army of Metz and Thionville, and to avoid being surrounded they would have no option but to withdraw, under cover of strong rearguards, to their second line of defence between Rheims and La Fère.

The fortresses of Toul, Mézières, and Verdun would be left to be defended by their garrisons, and the two latter would probably be vigorously besieged by the Germans in order to open the railways, Metz—Verdun—Châlons, and Namur—Mézières—Rheims.

The French Army of the Moselle, to avoid being taken in rear, would have to throw back its left, and occupy a new line perpendicular to the Moselle. In this new position, its right flank and rear would be covered by the fortified line of the Moselle from Epinal to the Ballon d'Alsace, and by the strong front Belfort, Montbéliard. It could therefore only be exposed to a front attack. It would be connected by railway with depôts established at Bourges, Nevers, Dijon, and Lyons, it would have in its rear the whole of the south of France, from which to draw reinforcements, and it would so directly menace the communications of the German Army of Alsace, that the latter would probably be compelled to attack it under disadvantageous circumstances.

It appears then that a judicious employment of the French right wing

would, in some degree, mitigate the evil consequences arising from the German success in an attack on the centre of the French line. These consequences would, however, be sufficiently grave to render it desirable that every effort should be made to prevent such a disaster.

The German garrison of Metz is on the point of being raised from 18,000 to 25,000 men, and to meet this it would be most advisable for the French Government to maintain in the towns on the Aisne and Meuse (Réthel, Vouziers, Dun, Verdun, St. Mihiel, Toul, and Commercy), strong garrisons, amounting in all to 25,000 or 30,000 men, ready to occcupy at the shortest notice the range of heights between Dun and St. Mihiel. The position is naturally a very strong one, and if properly occupied might be held against very superior forces.

2nd Case.—Attack on the French Right.

The German Army of Metz and Thionville might leave a portion of its force to demonstrate against the Côtes de Lorraine, while the remainder would march southwards along the right bank of the Moselle, and unite with the Army of Alsace in an attempt to pierce the French line to the south of Nancy, between Pont-St.-Vincent and Epinal.

In the event of the attack succeeding, the French Army of the Moselle should retreat southwards, taking care to maintain its connection with Epinal, so as to retain the power of threatening the German communications with Strasburg and Alsace. The French centre and left would be attacked in front and turned on the right, while their lines of retreat southwards would be intercepted. Their best course would probably be to retire to their second line of defence between Rheims and La Fère.

The result of the success of this operation would then be the separation of the French armies, and the investment of the fortresses of Mézières, Verdun, and Toul. When the fortifications now in progress, however, are completed, the only assailable part of the line of the Moselle will be that from Pont-St.-Vincent to Châtel (20 miles), and the French ought to be able to assemble in time sufficient to repulse any attack on this front.

3rd Case.—Attack on the French Left.

While part of the German Army of Metz and Thionville would be left to menace the Côtes de Lorraine and the line of the Meuse, the remainder would unite with the Army of Luxemburg, cross the Meuse between Dun and Mouzon, and attack the French left with the view of turning their opponents' line of defence, and of forcing them to abandon in succession the Côtes de Lorraine, the Meuse, and the Argonnes. This operation would neither have the effect of separating the French armies, nor of cutting their lines of retreat southwards, and it would not therefore effect such decisive results as the first or second courses. It would, however, be the easiest for the Germans, with their present railway system, to carry out, and it therefore appears to be the one which they would most probably undertake.

In this case, the best course for the French would be to hold out on the left bank of the Meuse, between Stenay and Sédan, while a powerful army should debouch from Dun, Verdun, and St. Mihiel, march northwards in échelon across the plateau of Woevre, and drive the Germans back on Metz and Thionville.

If the French could be concentrated in time, and in sufficient force to execute an offensive movement on the right bank of the Meuse at the moment when the German Army of Luxemburg was engaged on the left bank, between Dun, La Chêne, Populeux, and Sédan, decisive results might be produced.

If, however, it should prove impracticable to carry out this offensive move-

ment on the right bank of the Meuse, either in consequence of the French concentration not being effected rapidly enough, or of serious reverses sustained by the army on the left bank, the French retreat should be directed not on their second line of defence and towards Paris, but southwards, passing to the west of the Argonnes, and across the space between the Aire and the Meuse.

A retreat southward would have the following advantages :—

1. The advance of the Germans on Paris would be checked, and they would be compelled to follow the French armies.

2. With every step to the rear the French forces would increase.

3. The French armies would have only one flank unsupported, and that the left, which would be least exposed to attack.

4. All the lines of communication with the south would be directly covered by the French armies.

5. The retreating armies would find an excellent defensive position on the left bank of the Ornain between Bar-le-Duc and Commercy, where their right flank would be covered by the forts of St. Mihiel and Toul, and from which they might either take the offensive on the plateau of Woevre, or debouch in mass on the right bank of the Moselle and Meurthe. (For the execution of the latter manœuvre it is indispensable either that Nancy should be fortified, or that a bridge-head should be formed on the right bank of the Moselle and Meurthe.)

The French armies, after their retreat, would now be concentrated on two strategic fronts, at right angles to each other, one from Blesme to Toul, the other from Pont-St.-Vincent to Epinal. In this position they could hold out for an indefinite time, since the forts on the Upper Moselle and the fortified line Belfort-Montbéliard would render any attacks on their flank or rear impracticable.

The German armies, on the other hand, would be separated by the Côtes de Lorraine, the Meuse, the Argonnes, and by the line of forts extending from St. Mihiel to Verdun.

If the result of the battles fought on the line Blesme—Bar-le-Duc—Commercy, were favourable to the French, they should take the offensive by their right from Toul and Nancy, and drive the German Army of Alsace back over the Vosges.

If, on the other hand, the French were beaten, they should continue their retreat southwards, leaving Toul to be defended by its garrison. They would find a second good defensive position the line Charmes—Neufchâteau—Joinville, where their right would rest on the Moselle and Epinal. Still further south is a third very strong position between the plateau of Langres on the left and the Ballon de Servance on the right, and having its rear protected by the fortified line Belfort—Montbéliard.

If, after their assumed defeat north of the Argonnes, the French armies of the Ardennes and of the Meuse adopted a different course, and retired westwards, they would separate themselves from the Army of the Moselle and draw the German armies after them towards Paris, through the richest and most fertile provinces of France. Besides, on resuming the offensive, they would have to make a direct attack on their enemies without having it in their power to threaten their communications.

The French Generals should therefore, at all hazards, avoid retiring on Paris, the defence of which should be left to the territorial troops of the west of France.

"Doubtless," Major X. concludes, "the French are not in a condition to "undertake an offensive war against Germany, but after the completion of "certain railways, they need be under no apprehension as to the consequences "of a defensive war. In 1870–71, there were many reasons for their want of "success, but it cannot be denied that the main cause of their unprecedented "defeats was faulty direction at the outset of the war. If the armies of Metz and

"of Sédan had retired in time towards the south, they would soon have been "reinforced by a considerable number of troops commanded by reliable and "experienced Officers. The war would have gone on with alternating success "and failure, but most assuredly, peace would have been concluded without "the loss of French territory.

"At the present day, it seems impossible that a defensive war can be badly "conducted if the concentration is well managed. A good selection of the "points of concentration will be the main element of success."

Defence of the Frontier Provinces of Germany Against a French Invasion.

While French military writers have been discussing the means of opposing a German invasion, those of Germany have not altogether left out of sight the possibility of the offensive being assumed by France. The following is an abridgment of the views on this subject contained in a pamphlet lately published by a German Officer.[1]

If we examine the frontier provinces of Alsace and Lorraine with reference to their capability of defence against a French invasion, we are at once struck with the deficiency of the latter in natural bulwarks. Its northern portion is indeed protected in some measure by the course of the Moselle, but towards the south and south-west, it lies comparatively open.

This deficiency in natural obstacles has, however, been in a great degree made good by art.

The great fortress of Metz, besides commanding the line of the Moselle to the northward, contributes most powerfully to the security of the naturally unprotected south-west portion of the province. An invader seeking to penetrate into this portion of Lorraine could not venture to pass on, leaving Metz intact on his flank, he must besiege, or at least closely invest it, and from its great extent and powerful garrison, either of these operations would require the employment of a very considerable force.

Supposing the investment to have been successfully accomplished, the advance of the invading army would in all probability be directed not to the barren regions of the Eifel and Hundsrück, but to the fertile plains of the Rhenish Palatinate, and a fresh obstacle would soon be presented in the fortress of Strasburg.

The Strasburg of to-day is very different from that of 1870. The latter consisted of an enceinte of antiquated construction and was entirely destitute of detached forts. Since then, the enceinte has been considerably extended and has been further surrounded by a girdle of powerful detached forts which extend to the right bank of the Rhine. Before an invader, therefore, can proceed to invest Strasburg, he must effect a passage over the river and establish himself on the further bank.

Alsace is protected by the Vosges mountains along its western frontier from invasion by any considerable force. Small parties, indeed, might penetrate through the various mountain passes, but these could be easily held in check by troops brought up by railway from Strasburg.

At the south-western extremity of the province, however, there is a gap between the Vosges and the Jura mountains, and as the roads are here commanded by the fortifications of Belfort, an invading army might make its way into Upper Alsace and even effect a passsge over the Rhine before the Germans could be in a position to offer resistance. But as the country on the right bank, through which the further progress of the invaders would have to take place, is most unsuited to the movements of large bodies

[1] "Die Befestigung und Vertheidigung der Deutsch-Französischen Grenze." Mittler. Berlin.

of troops, it seems improbable that Germany would be threatened with a serious invasion from this quarter. Demonstrations might certainly be looked for, especially as the passage of the Rhine in the neighbourhood of the Swiss frontier might be effected without much difficulty, and as such an undertaking, though in itself of little real advantage, might yet exercise a moral influence on the operations in other parts of the theatre of war. It seems advisable, therefore, that the fortress of Breisach should be extended so as to embrace both banks of the Rhine, and should be furnished with a garrison strong enough to check any such hostile movement.

Assuming that a French invading army has succeeded in investing or capturing Metz and in penetrating into Lorraine and Alsace, its next object will be to cross the Rhine, and this would appear to be a somewhat hazardous operation.

The Upper Rhine, from Basle to Mannheim, might certainly be bridged in many places without great difficulty, but the country on the right bank is an almost roadless mountain region, through which the invader could move but slowly. Also, in the centre of this tract lies the fortress of Strasburg, commanding both banks of the river, and, therefore, menacing his communications, while the stronghold of Rastatt bars the railway on the right bank and presents an obstacle to an extension down the river.

Further down, especially about the mouth of the Main, local considerations are more favourable to a passage, but here the fortress of Mayence commands both banks of the river and would have to be invested, at least, by a considerable force.

From Mayence to Bonn the country adjoining the Rhine is mountainous and unlikely to be selected as a theatre of warlike operations, even without taking into account the influence of Coblentz and Ehrenbreitstein.

Lastly, an attempt to cross the river below Bonn could only be apprehended in the event of the invaders violating the neutrality of Belgium, a contingency which is not at present deemed probable, and if they did, they would have to deal with the fortresses of Cologne and Wesel.

The Rhine, therefore, from Basle downwards, forms an obstacle which an invading army could not leave in its rear without ample and well-secured lines of communication, and without having in its possession at least one great stronghold on the river.

With regard to the former point, there is no lack of railway communications over the Rhine, but most of them are guarded by German fortresses, and those which are not so protected would, in anticipation of an invasion, of course be broken. The construction of a railway bridge over the river, during the course of a modern war, must be looked on as impracticable, and the invader will thus be driven to the resource of forming a connection between the railways on each bank by means of bridges of boats, steam ferries, &c., a very inadequate means of providing for the numerous requirements of a great army. A further impediment to his advance will be the fact that care will be taken by the German officials to prevent the rolling stock of the railways on the right bank of the Rhine falling into the hands of the enemy.

In order to acquire a strong fortified point on the Rhine from which to base his further advance, the invader will be compelled to lay siege to one of the great German fortresses. But by the employment of troops for this purpose, as well as for the blockade of Metz and Strasburg (or Mayence), and for guarding his communications, the numerical superiority in troops available for active operations, which he will probably have originally possessed, will be swallowed up. A pause in the progress of the invasion will be inevitable and time will thus be afforded to Germany to prepare for further resistance.

How this resistance might be organized, we shall not proceed to consider, and only remark in conclusion that the defensive measures adoped in Alsace

ERRATA, PAGE 752.

Third line from bottom, *for* "12" *read* "52."

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and Lorraine seem to indicate that in case of attack, Germany intends to defend her frontier provinces actively, not passively. Her forces will be concentrated on a few points, and they will not limit themselves to a passive resistance, but will, by aggressive measures, force the invader to move against them. On this principle, many of the former smaller French fortresses in Alsace and Lorraine (*e.g.*, Marsal, Lichtenberg, Lützelstein, Pfalzburg, Schlettstadt, Landau) have been abandoned as military positions. Thionville, Saarlouis, New Breisach, and Germersheim have only been retained to serve as bridge-heads. Even the preservation of the stronghold of Bitsch to bar the Saargemünd—Hagenau railway has encountered strong opposition, as not being in harmony with the principle propounded by Count Moltke and now generally recognized in Germany, that the best means of protecting the railways of a country, is not the passive defence of certain points on them, but the adoption of vigorous offensive measures.

MODERN FIELD ARTILLERY.

By Capt. Walter H. James, R.E.

In the following pages, it is proposed to give a short account of the armaments of the various European artilleries, together with a brief statement of the present situation of the field-gun question.

The history of modern artillery may be divided into three epochs. The first, the introduction of rifled cannon, in the Italian campaign of 1859, which showed the advantages of the new weapons. The second, their general adoption by all European Powers and their employment in the campaigns of 1866 and 1870–71. The third, the introduction of the present armaments by the different European Powers after the Franco-German War, which showed the necessity for improved and more powerful guns. Looking round now at the field artilleries of Europe, we find them all armed with guns of high initial velocities, firing shrapnel and improved forms of common shell.

In the first campaign, that in Italy in 1859, in which rifled guns were used, their effect would seem to have been chiefly moral. The Austrians found they were struck at ranges at which they had hitherto been safe from artillery fire. But the records of the war by no means go to show that the physical effects of the French guns were very great. Indeed it would be surprising if they had been. For although an improvement on the old smooth-bores, the new weapons were still extremely inaccurate, and the projectile they fired, an ordinary common shell, was, so far as its man-killing powers were concerned, very inefficient. Moreover, by the introduction of rifled guns, the artillery were deprived of the use of grape shot, while the range and effect of canister were much diminished, owing to the small powder charge employed, and consequent low muzzle velocity. Still the path of progress lay in the direction of rifled arms, although there were not found wanting those who still sighed for the old guns with their deadly effect up to 600 or 700 yards. Now it must be observed that there is much more in this objection than would at first sight appear. In fact, when first introduced, the sole advantage of rifled guns lay in their superior range and superior accuracy, at long ranges. On the other hand, the shells they fired were not as effective as the old projectiles, grape and canister, within the ranges at which these had formerly been used. But the general introduction of rifled fire-arms had a reflex action on the artillery. It had become necessary, since the infantry could now act against artillery at far longer ranges than formerly, for the latter to recover their old position by improvements in their weapons. Since, at comparatively close ranges, they now suffered infinitely more than for-

merly, their object would evidently be to obtain guns which, by increased accuracy at longer ranges, would enable them to fire as effectively from them as they had formerly at close ranges. Hence it followed, since smooth-bores were susceptible of no further improvement, rifled guns became a necessity of the age.

The short campaign of 1864 increased the general impression in favour of rifled field-guns, which was further confirmed by the war of 1866. In this campaign the Austrian artillery was armed with a bronze muzzle-loading rifled gun, while the Prussian was equipped partly with smooth-bores, and partly with steel breech-loaders. The technical results of the struggle were small. This may be attributed to the fact that the Prussian guns, which were in themselves superior in power to the Austrian, were not so well handled. The poor results obtained from the Prussian artillery were therefore laid almost entirely to this head, while the Austrians, conscious of having obtained good results from their weapons, saw no reason to change them. When, therefore, war broke out with France, the German artillery, although now armed entirely with breech-loaders, had not advanced in a technical sense beyond its position in the last war. In the campaign of 1870–71, we find on the one side, good guns, well handled; on the other, bad guns, badly handled. As a natural consequence, the victories of the Germans were attributed in a great measure to the better armament of their artillery, and one of the first efforts made by the French, even during the war, was to provide better guns for their artillery. The Reffye[1] "canons de 7," with which a large number of batteries raised during the war in the provinces were equipped, were in many ways far superior to the muzzle-loading guns they replaced; but these in their turn have given way to still better weapons. Similarly in Germany, the first thing done on the termination of the war, was to entirely re-model the armament of the artillery, with a view to obtaining more powerful guns. But before describing how this has been done, it may be well to examine more closely what the chief defects of rifled guns, as they existed up to 1871, were.

Smooth-bore guns fired round shot, shell, shrapnel, grape, and case. Of these, shrapnel has been used with considerable effect, chiefly by the British artillery, in many fights, but it had not been a projectile in general use in the field artilleries of Europe, nor had it been used with conspicuous effect in any well-known battle. We may therefore leave it out of consideration. Round shot is manifestly less efficient for field-guns, used chiefly against men or easily destroyed buildings, than shell. It was partly for this reason that the French adopted the Canon Napoleon, firing a shell of about 12 lbs. weight as its main projectile and to the entire exclusion of solid shot. So far then as common shell are concerned, the rifled guns which threw them more accurately than smooth-bores, and to longer ranges, were better weapons than the latter. On the other hand, rifled guns could not fire grape and canister, while the common shell did not efficiently replace these projectiles within their own special ranges. The reason of this was, that although grape and case could be fired from rifled guns, still the small charges used gave them such a small velocity that their effect was considerably diminished.

This becomes more clear from the following facts. The muzzle velocities of the 12-pr. and 9-pr. bronze guns were 1,769 and 1,613 feet; but the muzzle velocities of the Armstrong 12-pr. and 9-pr. guns were only 1,150 and 1,057 feet per second respectively. The consequence was, that if we compare the two 12-pr. guns we find within ranges of 700 yards, *i.e.*, grape and case ranges, the smooth-bore had the higher velocity and better effect.

[1] The Reffye gun had been experimented on before the war broke out. It is described at p. 585, *et seq.*, vol. xx, of the Journal of this Institution as the French gun.

To improve upon the man-killing power of the rifled projectiles was therefore the first thing to be done. It was desirable to obtain some form of shell which would break up into a larger number of fragments, and thus bring back again the old effects of case and grape, but with the additional advantages of range and accuracy conferred by the rifled guns. The first step in the desired direction was the introduction, by Sir W. Armstrong, of the well-known segment shell. The construction of this ensured its breaking up into a much larger number of fragments than any common shell. Thus the 12-pr. segment shell contains 48 segments, of these 42, each weighing 1½ ozs., forms in itself a respectable projectile, in addition to which must be added the fragments of the outer skin of the shell. A common shell for the same gun on the other hand would only yield about 20 to 30 fragments. But the segment shell, though in many ways an improvement, was by no means a perfect projectile. When first brought forward it was thought that it might supersede all other natures, supplying in itself the various requirements of common shell, shrapnel, and case shot. It was, however, soon found out that it could perform but imperfectly these various and antagonistic aims. The irregular form of the segment, which is shaped like the key-stone of an arch, rendered it ill-adapted for flight. This, together with the rapid rotatory motion it had acquired by the revolution of the projectile, and the central position of the bursting charge, caused too great a dispersion of fragments to effectively cover any great depth of ground. It was necessary, therefore, to burst the shell close up to the object, and to use a percussion fuze. No proper shrapnel effects could be obtained from it when used with a time fuze, while as case shot it was nothing like as efficient as the old form. Moreover its small bursting charge made its incendiary effects considerably less than those of the common shell. It was consequently never adopted by foreign governments, who preferred the common shell which was considered on the whole to be more generally useful, although the segment shell had undoubted advantages in special cases. The next step, therefore, was to seek for some other form of projectile with increased man-killing power, and recourse was naturally had to the shrapnel shell.

As it was in England that the necessity of increasing the number of fragments of the common shell had first been thoroughly appreciated, so was it in England that the shrapnel was first adapted to rifled ordnance.[1] Now the efficiency of a shrapnel shell, other things being equal, depends on its velocity at the moment of rupture, *i.e.*, on the velocity which the bullets receive when set free. This velocity depends on the muzzle velocity and the power to overcome the resistance of the air, possessed by the shell. In the case of a common shell it is not alone its own velocity at the point of rupture, but the force with which its fragments are projected by the bursting charge, that has to be taken into consideration. The value of high velocity, therefore, in the case of the shrapnel soon becomes evident. We find, therefore, that in this country when experiments were undertaken with a view to obtaining a field-gun suitable for India, it was at once determined to start with a muzzle velocity considerably in advance of anything yet attempted. Similar reasoning has affected in like manner the progress of foreign artilleries. Looking back at the past history of the field-artillery question, it is curious to see how, when first introduced, the superior accuracy of the rifled guns seems to have quite thrown into the background the advantages to be obtained from high velocity, viz.: accuracy and flat trajectory, *i.e.*; greater depth of ground covered. No doubt with us in England, when rifled guns were first introduced, the defective system of breechloading, which was not suited to high

[1] A shrapnel shell for rifled ordnance was suggested by Lieut.-Col. Hope, V.C., shortly after the Crimean war. The service shrapnel differs but little in principle from this shell, which it is believed may still be seen in the Model room at Woolwich.

charges, had something to do with the question ; while in Germany, the same defect accompanied with the fact that the material employed was solid cast steel, the manufacture of which was not so well understood as now, must also have had its influence. At any rate, we find that when first introduced, rifled field-guns fired charges of only one-eighth to one-ninth the weight of the projectile.

This is shown from the following table, which gives the ratio of the weights of the charge and shell, and the muzzle velocity in the horse artillery weapons of some of the European States at the time we speak of :—

	Ratio of weight of charge to shell.	Muzzle Velocity.	Weight of Shell.
England ..	$\frac{1}{8}$	1,057 ft. per sec.	9·25 lbs.
Prussia ..	$\frac{1}{8{\cdot}1}$	1,184 „	9 „
France.. ..	$\frac{1}{7{\cdot}4}$	1,066 „	8·9 „
Austria ..	$\frac{1}{7{\cdot}3}$	1,093 „	8 „

Now the old smooth-bore guns with their charges varying from one-third to one-fourth gave velocities in the case of the 12-pr., with a charge one-third weight of shell, of 1,769 feet ; in the 6-pr., with a charge one-fourth weight of shot, of 1,484 feet. So soon, however, as it was determined to re-introduce the shrapnel shell, the necessity for an increase in velocity became apparent, and this advance was facilitated by the considerable progress made in metallurgy and gun construction, and which rendered it possible to use much larger charges than had formerly been employed.

The first great stride in the desired direction was the introduction into the British service of the bronze 9-pr. muzzle-loading gun for use in India. This weapon, with its muzzle velocity of 1,381 feet, shows a considerable advance over the guns given in the foregoing table, the shells of which weigh about the same. It having been shown what could be done in this direction, further progress was soon made. But the bronze gun proved in many ways unsuitable. It was too heavy, and the material of which it was made was uncertain in its texture. Recourse was therefore had to steel and iron. Steel tubes had previously been in use in this country for the barrels of guns, while on the Continent it was a material rapidly growing in favour. To steel tubes hooped round with iron coils, a method of construction which had proved highly successful with both large and small natures of ordnance, recourse was now had in England, while in most foreign nations steel alone was the material employed. But considerable divergence took place in the lines of progress followed. Whereas we went back to muzzle-loaders ; all foreign nations which had not previously had them, adopted breech-loaders. This change of front in our service was due chiefly to the report of a Committee of artillery Officers of the highest rank appointed in 1866, who reported against breech-loaders for field artillery equipment as possessing no advantages over muzzle-loaders, and being at the same time much more complicated. This fact, together with the difficulty of manufacture and repair in India of Armstrong breech-loaders, seems to have led to the trial with the bronze weapon for Indian service. The result was, that England, which had been the first to adopt breech-loading field-guns, now went back to muzzle-loaders.

Nor was this change of opinion altogether unjustified when the various circumstances of the time are taken into consideration. The Armstrong breech-loading system was a very imperfect and complicated one. The

only Power then using breech-loading field artillery was Prussia, and it was certain that although these guns were good they were by no means better than the 9-pr. and 16-pr. muzzle-loading guns which it was finally proposed to adopt in England. Indeed it must be admitted that the 16-pr. was a distinct advance on the old pattern 9 cm. Prussian gun, while the breech-loading systems in use in the Prussian 8 cm. and 9 cm. guns, the latter especially, were by no means perfect. Taking into consideration then that, at the time the Committee reported, no really good breech-loading system was known, and that the direction which artillery progress would take was not foreseen, it cannot be wondered that it was determined to go back to muzzle-loading guns. The country was right to adopt the Armstrong guns when they were adopted, it was right to adopt the present muzzle-loading equipment when it was adopted. In both cases, the best gun of the time was the result; in fact, in the words of the French Committee, speaking of the results of an exhaustive series of experiments conducted in 1872, with an 8-cwt. 9-pr. gun, "the Woolwich *matériel* taken altogether constituted a first-"class system of field artillery."

But, unfortunately, the artillery question stands no more still than any other branch of military art. The continued progress in mechanical skill puts the gun of 1870 much behind the gun of 1880, and doubtless the guns we now make will in their turn be surpassed.

We have said that the war of 1870–71 produced a revolution in the field-guns of Germany. It is true that previous to that war experiments with improved guns had been made; but it was doubtless the experience acquired in this war that forced upon the Prussians the urgent need of increased power in the artillery.[1] Not that it must be supposed for one moment that the German guns had not had great effect in the struggle, or that they had not on several occasions greatly contributed to the victory. For French accounts attribute 20 per cent. of their losses to the German guns. But it was seen and admitted that in the face of the new firearms, and in the use of long range fire by the infantry, the artillery in its turn must again move forward. Increased power was to be sought in three ways. First of all the light field batteries were abolished, and one heavy gun adopted for all. Secondly, the power of guns was much increased by firing larger shells with heavier charges, giving considerably higher velocities. Thirdly, the man-killing power of the common shells was increased and a shrapnel introduced. These improvements have since been followed by all the principal European Powers.

Before considering, however, what the result of these improvements will be, and in what direction further progress lies, it will be well to describe briefly the armaments of the various field artilleries of Europe.

Commencing with the German guns as the pioneers along the path of progress, they are made of cast steel hooped round the breech with a jacket of the same material. The breech-closing apparatus is that known as the "Rundkeil Verschluss," (round-wedge breech), *i.e.*, a cylindro-prismatic wedge tightened in the gun by means of an interrupted screw acting perpendicularly to the axis of the bore.[2] The gas-check is composed of a ring of soft steel; it acts on the Broadwell principle, butting against a steel plate in the surface of the wedge.

[1] In 1868, Herr Krupp commenced a series of experiments with a view to increasing the power of the field-guns manufactured by him. In 1869, from a gun weighing 617 lbs., he succeeded in firing a projectile of 9·25 lbs. weight, with a velocity of 1,869 feet per second, *i.e.*, from a gun about the same as our 9-pr. of 6 cwt., 500 feet more velocity was obtained. From this gun a series of further experiments led eventually to the present armament of the German Artillery.

[2] The interrupted screw might be more accurately described as a series of inclined planes.

The Russian guns and the Italian 9 cm. gun are of similar construction, and they as well as the German guns are supplied to the various Governments by Herr Krupp, the well-known steel manufacturer of Essen. Their breech-loading mechanism, as well as that of the Italian 7 cm., are similar to that employed in the German guns. The French guns are also of steel, and are strengthened round the breech end by six mild steel rings, which as in England are put on hot. The Italian 7 cm. is a bronze gun. The Austrian guns are made of the so-called steel bronze. It is composed of an alloy of 92 parts copper and 8 tin. The guns are cast in chill in iron moulds, and the bore is hardened and compressed by forcing coned steel mandrils through it. By this means the material is brought into such a state that from the inside of the bore to the external surface of the gun the metal is brought into the most favourable condition for resisting the explosive force of the fired gunpowder. The breech action of the Austrian field pieces is similar to that of the German guns, except that the wedge has not a round back; but the edges of the rear surface are chamfered off.

The breech-closing mechanism of the French guns presents several peculiarities. It consists of a solid interrupted screw. The surface of the thread of both the male and female screws being divided into six equal parts, the alternate ones are removed, so that one-sixth of a turn disengages the thread and allows the breech screw to be removed. The gas-check consists of two parts, viz.: a steel mushroom-shaped plate, the long stalk of which projects through the breech screw, and is allowed a certain amount of play backwards and forwards, and the elastic gas-check. This latter is composed of a thick cake of 65 per cent. asbestos, and 35 per cent. mutton fat. This cake is covered with canvas and enclosed between two tin cups, the edges of which are protected by brass rings. It is strung on the stalk of the mushroom, and rests between the posterior surface of the latter and the anterior face of the breech-screw, and serves by its elasticity to close the breech when the charge is fired. The guns are central vented through the stalk of the mushroom. The German and Russian guns and the Italian 9 c.m. are vented through the breech-piece, and the vent is so arranged that the charge cannot be ignited till the former is screwed home. The Austrian guns and the Italian 7 cm. are vented through the metal of the gun.

The projectiles employed by the Austrian, German, Italian, and Russian guns are of three kinds, viz.: ring double-skin shell, shrapnel and case shot. The French guns, like our own, fire common shell, shrapnel and case. The ring double-skin shell is particularly deserving of notice. The inner skin consists of a series of superimposed rings, the inner surface of which is smooth, but the outer is shaped into a series of pyramidal teeth. The outer skin is cast round these, and serves to bind them together. Thus constructed, this shell gives four to five times the number of efficient fragments that our form of common shell does.

In the shrapnel of Austria, Italy, and Russia, the charge is placed at the bottom of the shell. In the German shell it is placed in the centre. The type of shrapnel shell provisionally adopted in France for the 9 cm. guns differs considerably from those adopted by other nations. It consists of a series of superimposed rings of iron balls, nine in number, each row containing eight balls and three rings of segments, two at the top of the rings of balls, and one at the bottom. The metal of the shell is cast round these and holds them in the proper place. The charge is placed in the centre of the shell. At present, no shrapnel has been definitely adopted for the 8 cm. gun. Experiments have also been made with shells which form a combination of shrapnel and double-skin shell. The Austrian guns are provided with carcases. The projectiles of the Austrian, French, Italian, and Russian guns take the rifling by means of upper rings. The Germans still adhere to the thin lead coating used by us with our Armstrong shells.

Here we may call attention to the simple method by which the copper ring is attached to the French shells. It is placed in the shell mould and the shell cast round. It is prevented from revolving by having the interior surface formed into a dodecagon. In the other projectiles above noticed, the copper rings are pressed into rings cut on the surface of the shell, which is evidently a longer and more expensive process.

The carriages of the Austrian guns are of steel, those of the German, Russian, and Italian 7 cm. are of iron. The French gun-carriages are partly iron, partly steel, principally however of the latter metal, of which the trail cheeks are made. The Italian 9 cm. has a wooden carriage. The limbers of all the above are of similar material to the gun-carriages. They open to the rear like a cupboard in the case of the German, Russian, Austrian, and Italian 7 cm. guns. The two French and the Italian 9 cm. limbers are of the usual construction. The whole of the above guns and carriages are driven by pole-draught and all the wheels have metal naves.

With regard to the rifling of the various weapons, there is but little that calls for remark. They all have polygroove shallow rifling of uniform twist except in the case of the French guns, which have a gaining twist.

In Table A are given the chief points necessary for a comparative study of the various field-guns now in the service of different foreign countries and our own.

The first point requiring remark is that the whole of them are breech-loaders, whereas ours are muzzle-loaders.

It is perhaps hardly worth while to refer to this time-honoured and much discussed question ; but for the benefit of those who are not fully aware of the arguments on either side it may be well briefly to allude to them. It must at once be conceded that as regards shooting qualities there is not much to gain from breech-loading, although if two similar guns be designed, and the one constructed as a muzzle-loader, with all modern improvements, the other as a breech-loader in *its* latest development, it will be found that a slight advantage as regards initial velocity and accuracy rests with the latter. Still there is really so little gain that this alone would not justify a total change of armament and the adoption of breech-loaders, which are undoubtedly more complicated than muzzle-loading ordnance of the type of our 9-pr. and 16-pr. guns. But unfortunately for this aspect of the question the modern muzzle-loader is by no means the simple weapon these are. One of the greatest advances in modern gunnery was made in the discovery that for uniform shooting, it is necessary that the powder charge should always occupy the same space. The latest guns too, whether breech or muzzle-loading, are provided with an enlarged powder chamber, "with a view to obtain increased "muzzle velocity, and therefore longer range and lower trajectory . . . . "without increasing the corresponding strain upon the piece." Now to use the powder-chamber and yet ensure that the charge always occupies the same space, it is necessary to stop the projectile at the same point of the bore every time it is rammed down. To do this, it has been found necessary to contract the bore just in front of the powder-chamber, thus forming a "choke." The result is, that it is difficult to sponge out the chamber as the sponge-head must be small enough to pass over the choke, and there is consequent liability to danger from burning residue left behind. Now in the breech-loader, when the breech is opened, the whole of the chamber can be seen and carefully sponged. It will be seen, therefore, that the muzzle-loader in its latest form possesses a disadvantage that the breech-loader does not.

With regard to complication, the latter is of course more complicated than the former by the addition of the breech apparatus. But it must be remembered that breech-loading guns have now been through three wars, viz., the Austro-Prussian, the Franco-German, and the Russo-Turkish. The Prussians used breech-loaders in the former two. The Austrians used muzzle-loaders against the

Prussians in 1866, and abandoned them for breech-loaders after '70–'71. The French have followed them. The Russians and Turks used breech-loaders and use them still. It must therefore be admitted that breech-loaders have had a pretty good trial, and that those who have tried them like them, and find nothing detrimental in their supposed complication. It is often quoted against them that in the Franco-German war a large number of guns became useless to the Germans by the failure of their breech mechanism. It should, however, be understood that the far greater proportion of these were 9 cm. guns, with an antiquated Wahrendorff breech-apparatus. But very few on the Krupp system failed, and since the further improvements which have been made in this (the introduction of the *round-backed* wedge), none have, so far as we are aware, ever failed. Both the Krupp and Vavasseur systems, the French system, and that now employed by Sir William Armstrong, which is a modification of the latter, are capable of affording a perfectly reliable system of breech-loading. When the Committee previously alluded to reported against breech-loaders they were perfectly right. No really efficient breech mechanism for field-guns was then known and their report may be taken as a report on the respective merits of the original Armstrong field-gun with its undoubted defects, not all of which were due to breech-loading, and the improved muzzle-loaders which were at that time being brought out. But the state of affairs sixteen years ago does not affect the question at the present time. Breech-loaders are in some ways more complicated, but they are safer than the newest muzzle-loaders for the reason we have seen, and they possess other undoubted advantages.

To begin with the projectiles. Guns are now rifled with increasing twists and a large number of shallow grooves. For muzzle-loaders constructed on such principles, the projectiles must be furnished with an expanding gas-check to take the rifling, which is a much more complicated affair than the simple copper ring used by the French, cast in the shell as above described. Moreover the long projectiles with small windage now employed, are liable to jam when being rammed down the long length of bore from the muzzle. This cannot happen in the breech-loader. One advantage which used to be claimed for muzzle-loaders no longer exists, viz., superior simplicity of fuzes. For with the newest development of the muzzle-loader it is necessary to use fuzes adapted for breech-loaders which carry their own ignition, as owing to the windage being done away with, the flame from the powder-charge cannot ignite the fuze. But, on the other hand, breech-loaders possess one advantage over muzzle-loaders, which in the days of increased power and range in rifle fire and the use of shrapnel shell, is of the very highest importance, viz., that the men working the gun are better sheltered as they have not to go out in front of it to load. With breech-loaders, light steel shields may be employed, behind which the gunners can work in safety from all bullet fire. With muzzle-loaders this cannot be done, as the loading numbers would have to go in front of them. To show how easily the gunners may be protected, we need only state that it has been proved by experiment that steel plates $\frac{3}{10}$ in. thick, will resist the fire of the Martini-Henry at 100 yards. Such plates weigh about 6 lbs. to the square foot and would protect the men against both shrapnel and musketry fire, while they are not liable to splinter. Indeed, shells fired at them with percussion fuzes, not only do not splinter them, but seem themselves to burst beyond the gunners.

There would seem, therefore, no doubt that we too shall follow the universal lead and adopt breech-loading field-guns. It is idle at the present day to repeat the time-worn objections which have done duty for the past fifteen years. We have the solid fact that there are over 10,000 breech-loading field-guns in Europe, 8,000 of which have been manufactured by Krupp, or on his system. It is impossible to believe that were this system so unreliable as is

sometimes implied in this country, that every great nation except France should have adopted it. For the French there are obvious reasons why it was inexpedient to rely on Germany for the supply of guns. But there was no thought, even after a careful series of experiments with our own type, of adopting muzzle-loaders. The reason is obvious, that given a projectile of a certain weight it is possible to make better practice with it out of a breech-loading than out of a muzzle-loading gun, while the former possesses the advantages of being safer to work, and rendering it easier to protect the detachment.

With regard to the gun carriages, it does not seem that we have much to learn from other nations. But there is one peculiarity in the Russian carriage which is especially worthy of note. With modern guns with their high muzzle velocities the recoil is very great, and must be checked to avoid the constant labour of running up. To do so by means of breaks applied to the wheels throws great strain on the carriage. To obviate this is the object of the Russian arrangement. The axletree is so arranged as to work backwards and forwards in a slot. From the axletree arms two stout iron stays run back to the trail, here they are joined by a bolt which is connected with one end of an elastic buffer, the other end of which is kept steady by a tie-bar connecting the cheeks of the trail. When the gun is fired, the gun and carriage recoiling while the axletree remains at first at rest, the elastic buffer is brought into play by the struts from the axle-arms, and absorbs a considerable amount of the recoil before the wheels begin to revolve, and thus the length of recoil is considerably diminished. This carriage is said to work very well in practice, and has been adopted for the whole of the Russian field artillery. It has also been successfully tried in England.

With regard to projectiles, it will be seen that first of all we carry a much larger proportion of shrapnel than the Germans or Austrians, who have two common shells to one shrapnel, while the Italians and Russians have about an equal number of each. This is no doubt largely due to the fact that the common shells of these Powers, as previously explained, are so arranged as to give a much larger number of fragments on bursting than our form of shell does. Our shells give between 30 and 40 effective fragments, those of the other Powers about 120 to 150. They thus in a measure take the place of shrapnel.

What will be the effect of the introduction of the field-guns which now form the armament of the different Continental artilleries? No European war has as yet been carried on with such guns, and we can therefore only judge from the results of field practice. It is true that the Turks made use of weapons which were practically the same as those which form the present armament of the German Artillery; but it must be remembered that from the uneducated Turkish soldiers we could not expect results at all equal to those which we should see obtained from similar guns properly handled by well trained artillerymen. On one point, however, the teaching of this war is very valuable, it shows the value of shrapnel fire. The Russian reports all unite on this point, and it will be found that the Russian Artillery carry a larger proportion of this projectile than most other European Powers.

The use of shrapnel and of common shell constructed to yield a large number of fragments, four or five times the number obtainable from the form still employed in England, fired from guns which give very high velocities, cannot fail to greatly enhance the effect of artillery fire. Even in former wars where guns have been well manœuvred, *i.e.*, massed, it is known that their effects have been very considerable. Thus in the war of 1866, of the Prussian casualties 16 per cent. were caused by the Austrian Artillery. In the war of 1870–71, 25 per cent. of the French losses were due to the German Artillery. According to recent experiments made in

France the destructive effect of the four batteries of a division armed with the 90 cm. gun is equal at a distance of 1,000 to 1,200 metres to that of the infantry of the division in the order of attack. Our own experiments at Okehampton also prove that great results may be obtained from properly handled guns.

Undoubtedly the tendency of modern warfare is to give greater value to a powerful artillery. Infantry fire has now become so terrible and its range has been so much prolonged, that it has become absolutely necessary to increase in like manner the range of artillery. It is of course well known that the effect of the latter increases as the range diminishes; but it is capable of greater increase of power at long ranges than is rifle fire. Thus at 3,000 yards the effect of artillery fire will be very considerable, while that of infantry would have lost most of its value. The French experiments before alluded to show that the proportion between the number of hits obtained by the artillery and by the infantry varies from twice as many at 800 metres up to seven times as many at 1,800 metres; these results being obtained with shrapnel or common shell, giving a large number of fragments and fired with percussion fuse.

In Table B is given a series of data which serve to show the accuracy of modern field-guns. It is a table that speaks for itself and requires no comment.

Having thus described the armaments of the chief European Powers, it is now proposed to give a short description of the most recent field-guns which have been constructed by various well-known makers.

It must be obvious to all that the gunmaker is in a far different position to a government department in so far as regards the question of improvements necessitating considerable changes in manufacture. The gunmaker has solely his own interests to consider, and these are best served by his keeping his guns in the front rank of weapons. In the case of a government department it must be remembered that its chief function is the production of weapons of a given type. The gunmaker can vary his pattern with the customer he supplies, and thus can make continual progress, while the department has to supply the wants of an arm in which uniformity of *matériel* is an essential. It follows, therefore, that the latter will always tend to be more or less conservative in its character, because cognisant of the difficulty and expense of sweeping change.

The opportunity for a government department to show its capability is a complete change in armament, such as we must shortly see in our field artillery. It is therefore of the highest utility to bring into light the progress that private manufacturers make, so that it may not be neglected by those whose duty it is to consider suggestions from all quarters. At the same time, by thus informing those who have not made a special study of artillery questions what the state of the case is, the position of the department will in turn be strengthened, and it will be enabled, by showing what has been done by others, to make, not a short step forward, but a stride.

In Table C will be found put together the chief dimensions of the guns forming the most recent productions of the great manufacturing houses of Armstrong, Krupp, and Vavasseur, together with some information concerning the latest experimental field-guns turned out from Woolwich Arsenal.

The Armstrong 9-pr., and the Krupp 7·5 cm., may be taken as the latest and best forms of light field-guns. The Krupp gun is in all essential points of manufacture and breech apparatus the same as has been supplied for some years past from Essen, and with which the field artilleries of nearly all Europe are armed more or less. It differs from it in the fact that it is much lighter and more powerful for its weight than any light field-gun in Europe. The Armstrong gun may be taken as a type of the Armstrong system in its latest development. Constructed of steel with an iron jacket, its breech is

closed somewhat after the French plan, viz., by an interrupted screw; but the obturation[1] is obtained by means of a shallow steel cup attached to the face of the breech-screw the edges of which by their expansion under the pressure of the fired gunpowder effectually prevent all escape of gas. The initial velocity of each of these guns is considerable, each carries a large number of rounds in its limber, while the weight behind the team in both cases is considerably less than with any other horse-artillery gun at present in existence.

To show what the Armstrong gun is capable of, we subjoin the following experiment; it was carried out with a gun similar in nearly every particular to the one described in the table, except that it was a muzzle-loader. It is, however, quite certain that the results from the breech-loader would quite equal those now about to be given. First of all for accuracy, ten rounds were fired at a target 9 ft. × 9 ft., at a distance of 1,100 yards. All of them hit the target, giving a mean vertical error of 1·3 ft. and ·51 ft. deflection. On another occasion these errors were ·97 ft. and ·58 ft. respectively. Experiments were then made to test the effect of a new form of shrapnel. A series of targets were arranged as follows: The first at 1,100 yards from the gun was 42 ft. long and 9 ft. high, with a thickness of ·8 in. Twenty yards behind this a similar target, but 54 feet long, was placed; and 20 yards behind this again a similar target, but 60 ft. long, was set up. Against these, 16 rounds of shell were fired with combined time and percussion fuze, but all arranged to act by time except one round. The total number of hits made was as follows:—

	Throughs.	Strikes.	Total.
Upon the 1st row	1,216	34	1,250
„ 2nd „	1,355	130	1,485
„ 3rd „	788	134	922
Total..	3,359	298	3,657

An average of over 200 "throughs" per round, or counting hits as well, 229 per round fired.

Now it will be observed that 97 per cent. of the hits on the front line of targets were "throughs," which shows that the velocity of the bullets was amply sufficient to disable a man, while the hits were not confined to the centre part of the targets, but were fairly distributed over the whole area, which proved that the shells acted properly.

To show what may be done with even a smaller gun, we subjoin the result of some recent experiments made with the 6·5 cm. jointed mountain gun, Krupp's manufacture. (*See* Table C.)

Three rows of targets, 8 ft. 10 ins. high and 98 ft. 6 ins. long, were placed 50 ft. behind one another, the first being 1,094 yards from the gun. Nine rounds of shrapnel shell fired against these with time fuze gave—

	Throughs.	Strikes.	Total.
On the 1st row	334	24	358
„ 2nd „	276	53	329
„ 3rd „	194	61	255
Total..	804	138	942

This gives an average of just 90 "throughs" per round, or 105 total hits, and this from a mountain gun, be it remembered. The tenth round was still better, the total number of hits being 160, of which 147 were throughs.

[1] "Obturation" is so good a word to express the English phrase "means for preventing the escape of gas," that although French, it may be pardoned in English composition.

It may safely be said that results such as have thus been attained by these two manufacturers have never hitherto been deemed possible.

The form of shrapnel used in either case is deserving of notice. In the case of the Armstrong gun the body of the shell is a cylinder of steel, the base is of wrought iron, and the head which screws into the body is of phosphor bronze. The charge is contained in the head of the shell. In the case of the Krupp gun the body of the shell is of wrought iron, and the charge is at the bottom of the shell. The Krupp shells take the rifling by means of a copper band forced into a groove a little above the base of the shell. This system was invented by Mr. J. L. Vavasseur, of the London Ordnance Works, in 1866, and is now adopted by all European Powers except England. The Armstrong shells take the rifling by what is known as the Elswick Ordnance Company gas-check ; *i.e.*, the lower portion of the base end of the shell is cut away, and a copper ring 1 inch high, and with a lip which overlaps the bottom of the shell, is soldered on the portion thus cut away. This ring has two grooves cut out of it to allow the lands to cut away the portion of the ring that comes in contact with them more easily.

The 7-pr. Armstrong, and the 6·5 cm. Krupp, are also deserving of special mention as embodying an improvement, the ultimate result of which cannot yet be fully seen. These guns are both intended for use in mountain warfare, and are constructed in two parts which screw together. By this means the gun is divisible into two handy lengths, each of which forms a mule-load ; in the case of the Armstrong gun, each portion weighing 200 lbs. When these are screwed togther, which can be done with great facility and quickness, a gun is obtained which far surpasses in the accuracy and velocity it gives anything that can be obtained from a mountain gun of ordinary construction, the length and weight of which are necessarily limited by the mode of carriage on muleback. The Armstrong gun now described has been used with considerable effect in Afghanistan.

The 13-pr. B.L. Armstrong and the 13-pr. B.L. and M.L. Woolwich, which are nearly identical in design, and give nearly the same balistic results, may be taken as representing the latest official experiments for the new armament of the British field artillery. The breech-loading system used is that already described for the Armstrong gun. The muzzle-loader differs from the field-guns formerly constructed in several important particulars. It is much longer than they have hitherto been made.[1] An enlarged powder-chamber is made use of with "a view to obtain increased muzzle velocity, and therefore a larger "range, a lower trajectory, and greater energy than existed in any previous "service field-gun, without increasing the corresponding strain upon the piece." The rifling is polygroove, the projectile taking the grooves by means of a copper gas-check. The base of the shell has an undercut groove round its edge, and radial grooves on its base. By the first the gas-check is attached to the projectile, by the second it imparts rotation to the shell. To prevent the shell entering the powder-chamber, the latter is at its front contracted so as to form a choke in the bore.

These guns represent a considerable advance on either the 9-pr. or 16-pr. service guns, and will hold their own with any of the guns of foreign Powers. (*See* Table B.) But they do not represent what modern artillery is capable of, and there is little doubt that they will be surpassed by the weapons which will form the future armament of the British field artillery, and to determine which experiments are now being conducted. The gun of the future will, however, certainly be a breech-loader, since the 13-pr. muzzle-loader possesses several defects which would be obviated by adopting a breech-loading system. These have already been alluded to, in discussing the relative advantages of breech and muzzle-loading ordnance.

[1] Cf. Table A, 16-pr. and 9-pr., with Table C, 13-pr. M.L.

The 13-pr. Vavasseur gun may be taken as an example of the high initial velocities which will without doubt be adopted when non-recoil carriages are successfully constructed. The great difficulty with high velocities is the enormous recoils which they give, which render guns using them practically impossible for field use with the present form of carriage. The advantage of such velocities giving increased accuracy and range, larger dangerous zones, and much greater efficacy to shrapnel fire, are universally admitted, and artillerists only await the practical solution of the carriage difficulty to adopt them.

The breech-closing apparatus of the Vavasseur gun, which otherwise resembles that employed by Krupp, is deserving of special notice, so far as the method of obturation is concerned. The gas-check or "obturateur" is a copper ring, cylindrical in form, lodged in a recess made for it in the end of the inner tube of the gun, and which bears against the butting plate in wedge. The butting plate is hemispherical, the flat surface to the front, and rests in a corresponding recess in the wedge, where it is held in its place by a bolt which passes through the latter. A gun so fitted has been recently fired 719 times without showing the least trace of erosion or other injury. Another gun was fired 1,374 times, with a charge one-third the weight of the shot, and then a small line was discovered in the powder-chamber. The firing was, however, continued, and after 1,640 rounds, the gun was still serviceable.

We have finally to draw attention to the 9·6 cm. Krupp gun. This weapon is in many ways specially deserving of notice. Recent wars have shown the desirability of increased power in the projectiles, with a view both to obtaining increased effect from shrapnel in the open, and also from common shell against earthworks. France has introduced as the main armament of her field batteries, a gun firing a shell weighing 18 lbs. The Russian heavy field batteries throw a shell weighing 27 lbs. The French gun weighs 3 cwt. less than our service 16-pr., while the Russian gun weighs about the same. Looking at the increase of weight which is evident in the projectiles of all the new guns (*see* Table C), it is pretty plain that the tendency is by improved methods of gun and carriage construction to increase the power of the gun without increasing the weight drawn by the team. The Russian heavy field-gun was constructed by Herr Krupp, and the 9·6 cm. gun was brought out by him with a view to obtain a gun firing about the same weight of projectile, but under more favourable conditions. To do this, not only improvements in the gun were necessary, but improvements in the carriage also. So far as the gun is concerned, it weighs, it will be observed, 31 lbs. more than our 16-pr., but fires a shell weighing 26 lbs. instead of 16 lbs., with an increased velocity of nearly 100 ft. per second. Its muzzle velocity is, in fact, practically equal to any of the heavy guns given in Table C, while its shell weighs half as much again as any fired from the heavy field-guns of Austria, England, France, Germany, or Italy, and it beats the Russian so-called 9-pr. because it has so much greater velocity. Notwithstanding these advantages the weight behind the team is positively 3 cwt. less than that behind our 16-pr., and is only 200 lbs. more than the French, German, or Austrian heavy guns, which fire so much lighter a projectile.

Such results have been obtained, first of all, by improved design in the gun; and secondly, by great improvements in the carriage. This latter is made entirely of compressed steel plate. The brackets of the trail are curved inwards at the edges, thus obtaining the rigidity of angle irons with less weight and without boring holes in the brackets to rivet the angle irons. The carriage weighs only 1,148 lbs., against 1,613 lbs. in the case of our 16-pr., 1,556 lbs. in the case of the French 9 cm. gun, and about the same as the carriage for the Austrian and German 9 cm. guns. It is provided with a simple form of break by which recoil can be checked. A comparison of the shrapnel shell fired from this gun with those at present

forming the service weapons, given in Table A, will show what a powerful weapon it is. The double-skinned shell which it, in common with nearly all European field-guns, fires, gives about 150 fragments weighing ·3 oz. and over. The range of this gun with 30° elevation is over 9,000 yds. with an elevation of 3° 28′, it ranges 2,187 yds., about the same as the 13-pr., but with a terminal velocity of 1,039 ft., whereas in the case of the 13-pr. it is only 950 ft. These results are due to the high proportion of the weight of the shell to its diameter. The accuracy of the gun may be judged from the fact that out of six shots fired at a target 2,187 yds. distant, and measuring 16 ft. 5 ins. by 16 ft. 5 ins., five struck the target, giving a mean vertical deviation of 28·5 ins., a mean horizontal deviation of 13·5 ins., and a mean difference of range of 6·65 yds. Such accuracy speaks for itself.

There are now-a-days a considerable number of military authorities who consider that to meet the increased use of field fortifications it will be advisable to take into the field some form of howitzer or short shell gun, which, while light in itself, shall yet carry a heavy shell. A weapon of this nature, setting aside its use in the field, would be eminently useful in many of the operations of a siege. The requirements of such a weapon would seem to be well fulfilled by a recent construction of Herr Krupp, viz., the new 15 cm. mortar. It weighs but 792 lbs., or on its carriage ready for service, 1,628 lbs., giving a total weight with the platform of 3,000 lbs., so that it can be very easily transported, while it fires a steel shell weighing 70 lbs., with a bursting charge of 4 lbs. 10 ozs. Fired at a range of 2,187 yds. with a charge of 2 lbs., it gave with 13 shots a mean difference of range of 11·3 yds., a mean right deflection of 6·34 yds. With the full charge of 3 lbs. 5 ozs. the range with 40° elevation was 3,775 yds. with a mean difference of range out of five rounds of 18·6 yds., and a mean deflection of 9·7 yds.

Before concluding this branch of the subject, it may be well to point out that in the newest form of shrapnel shell employed by Messrs. Armstrong or by Messrs. Krupp, the walls of the shells are constructed either on wrought iron or steel plate. By this means greater lightness with equal strength is obtained than if cast-iron were employed, and it is obvious that the less the shell of the shrapnel weighs, the more bullets can be put in it, *i.e.*, the more efficient will it be.

Let us now consider generally what the requirements of a good field artillery are. Putting aside for the moment the question of a mountainous country without roads, and taking into consideration the case of an army operating in Europe, what will be required of the field-guns? It must be remembered that even in Europe the nature of the country will vary considerably. The theatre of war may be France or Central Europe, with numerous and well-made roads, or it may be Turkey with no roads, or Northern Italy, cut up by canals and irrigating channels, so that the artillery are, perforce, confined to the roads; or it may be in a country like Poland, which at certain seasons of the year is one sea of mud. Mobility is therefore of the highest necessity. It is no good having guns which would be of great service *if* they reached the scene of action, but the weight of which prevents them doing so. Mobility being equal, that system is the best which gives the most powerful and accurate guns. The guns being equal, the best system is the one which carries the greatest number of rounds.

Briefly then, the typical gun system should be mobile, carry a large number of rounds, fire as large and powerful projectiles as possible, with a high velocity, and be capable of coming into action with a sufficient number of men to work it.

With regard to mobility. So long as we operate in a country with numerous and well-made roads like France or Central Europe, judging from Tables A and C, a weight of about 4,400 lbs. may be drawn by six horses. It is,

however, notorious that in the Russo-Turkish war the heavy field-gun, about the same weight as the German 9 cm., was found too heavy. For countries, therefore, in which roads are few or bad, the weight of the English 9-pr. 6 cwt. gun, which the experience of Zululand shows conclusively can be manœuvred wherever a waggon can go, should not be exceeded, *i.e.*, about 3,800 lbs. Given these weights, the foregoing paper and other recent experiments would seem to show that for the light gun we might have a projectile of about 10 to 13 lbs., while the heavier nature might fire a shell weighing about 20 to 25 lbs., the weights of the light and heavy guns being about 6 to 8 cwt. and 10 to 12 cwt. respectively.

With guns such as these, special provision would have to be made for absorbing recoil in the carriages, and experiments with the Engelhardt or some form of hydropneumatic carriage would probably show the best solution of the difficulty. Such suggestions are at first usually met by the dictum that they are too complicated or unsuited for the conditions of service. It is, however, perfectly certain that if light guns firing large charges are to be used (and he would be a bold man who will say that they will not), some such arrangement must be made use of. In proof of this we may say that the recoil of the new 13-pr. muzzle-loading gun on level ground is 20 ft.

For mountainous countries recourse must be had to jointed mountain guns carried on pack animals. With regard to the projectiles to be fired, putting aside case, three different aims have to be met. The one, man-killing power; the second, explosive; and the third, incendiary effects. For man-killing power in the open, shrapnel with time fuze is undoubtedly the best projectile. But it is not usually considered effective against men behind earthworks, even of a slight character, though recent experiments would seem to show that shrapnel fired with the high velocities now employed, if burst by percussion fuze are effective when fired through moderately thick cover. It would seem, therefore, advisable to adopt a fuze with combined time and percussion action, such as the French now use with their shrapnel shell, or as employed with the newest Armstrong guns.

The explosive effect of common shell fired from the latest form of field-gun is very small. The shell is very long for its weight, and contains therefore but a small bursting charge. Experiment will show whether it is possible by the use of guncotton to remedy this defect, while the use of this explosive might permit such a modification of the construction of the shell as would increase its man-killing power without diminishing too much its explosive force. The double-skin ring shell in use in all foreign artilleries is one solution to this problem, although it would seem that so long as gunpowder is used for the interior charge, the amount is too small to have much explosive effect (*see* Table A). If guncotton were employed it would probably be necessary to have recourse to a special type of incendiary shell like the Austrian carcass, or such as has been recently experimented with in England, *i.e.*, a shell with a small bursting charge and a number of "stars," which are lit by the explosion of the shell, and scattered about in a burning state.

With regard to fuzes, it is pretty well admitted that the present type of time-fuze is not a good one. The fault of not sufficiently fine graduation has been removed in the 15-seconds fuze; but the clumsy method of boring is still maintained. All other nations use a fuze which requires only simple adjustment for range, and the fuze can therefore be carried in the shell. With our system it is necessary to bore the fuze before fixing, a somewhat delicate operation under fire, and which prevents the shells being carried fused. Moreover, the fuze once bored can only be used for that range. Progress in fuzes seems to point in the direction of combined time and percussion fuze, so as to ensure the shell acting on graze, if not before. Such fuzes are now in use in the French and Swiss artillery, and other nations, including ourselves, are experimenting in the same direction. It would also

be desirable to try if some composition could not be found more of the nature of a chemical compound, so as to burn more regularly, and which would not be liable to deterioration like that now used, when kept in store.

It is also necessary to draw attention to the sighting of our field guns. It is no use having a weapon with which it is possible to hit the door of a room at 2,000 yards, if the sights it is provided with render it impossible to lay it with accuracy. The telescope sights proposed by Captain Scott, R.E., render fire three times as accurate ; but they appear, at least in the opinion of most Artillery authorities, to be too complicated for field use. It is, however, surely within the bounds of optical possibility to construct a telescopic sight which shall fulfil the required conditions of service, and we have but little doubt that an appeal to English opticians would soon produce the required instrument.[1]

Lastly, we may be permitted briefly to touch on the question of gunpowder. With high velocity and flat trajectories the differences of range are considerable. They are due first of all to the want of uniform elevation due to inaccuracy of our present system of sighting, and secondly, to the want of uniformity in the explosive effect of the powder. To give an idea of what a difference may be made by want of uniformity in the weight of powder charge, we may state that with a Remington rifle firing a powder charge of 80 grains, a difference of 1 grain more or less in the weight of the charge will raise or lower the position of the hit on a target 9 ins. at 1,000 yards. The charges therefore must be always accurate in weight, while the powder must be exceedingly regular in combustion. It is doubtful whether in this particular we have made as much progress in England as has been made in foreign countries, notably in Prussia, with prismatic powder, and in Italy with the so-called Fossano powder.

From the foregoing pages it is pretty evident that in our present position we are behind, considerably behind, the rest of Europe, in the armament of our field artillery. It is not the purpose of this article to inquire why for some years past, while other nations have steadily been progressing in the manufacture of guns, we alone seem to have been standing still. The fact that this has been the case must be patent to all, and at last we seem awakening to it. We have now an opportunity of providing our artillery with a gun system, which may be as far ahead of anything at present existing, as the Martini-Henry was ahead of the Prussian needle gun : let us not throw away such a chance by contenting ourselves by merely catching up other Powers, let us rather try far to surpass them. Looking then to the fact that the Martini-Henry rifle was the result of a public competition before a Committee of a not purely official character, would it not be well to have a public competition for field-guns? Trials at which Armstrong, Krupp, Schneider of Creusot, Vavasseur, Whitworth, and the Woolwich authorities, were each represented, would certainly throw considerable light on the question, and the money which it might be necessary to spend on the experiments and for rewards, would undoubtedly be well expended in obtaining for England the best field-guns in the world.

[1] Experiments, the result of which strikingly illustrate the influence which sighting exercises on the accuracy of Field Artillery, have recently been carried out in France. Twelve rounds were fired from a 95 mm. field gun=16 pr. English gun at a range of 2,750 yards at a target 5¾ feet high × 3¼ feet broad. The gun was fitted with Captain Scott's telescopic sight; it was laid by different individuals, and for the 5th, 6th, 7th, 8th, and 10th shots one wheel of the gun carriage was placed in a hole in the ground, producing an inclination of 10° in the wheels. The mean rectangle obtained was 3·3 yards in range, and 0·44 in direction. This result, obtained on service conditions, is stated to be 12 times better than the shooting of the same gun, and 96 times better than that of the new English 13-pr. field-gun with the service sights. "Range and Accuracy Practice," L.A.H.

ADDENDUM TO TABLE B.

Since this article was printed we have been enabled to obtain accurate information for the probable rectangles of the 9 and 16 pr. guns, which we give below.

Range in Yards.	9 Pr.		16 Pr.	
	Length.	Breadth.	Length.	Breadth.
	ft.	ft.	ft.	ft.
1,100	40·2	4·26	62·1	3·06
1,650	55·2	6·75	85·8	4·92
2,200	75·0	9·21	105·6	7·05
3,300	134·4	14·16	132·6	11·88

TABLE B.

Showing relative accuracy of some of the guns described in Tables A and C.

N.B.—50 per cent. of the shots will fall within the length or breadth given. 25 per cent. within the rectangle formed by multiplying these two dimensions together.

Range in Yards.	Austrian.				English.				French.				German.				Italian.				Russian.						English Experimental			
	8 cm.		9 cm.		9-pr.		16-pr.'		8 cm.		9 cm.		8 cm.		9 cm.		7 cm.		9 cm.		4-pr. H.A.		4-pr. F.B.		9-pr.		13-pr. M.L.		13-pr. B.L.	
	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.	Length.	Breadth.
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
1,100	39	2·6	48	2·3	78	3·6	—	—	52·5	1·3	53	1·3	62·3	2·6	59	2·3	—	3·38	36	1·6	58·4	2·7	65·6	1·3	—	—	40·5	2·5	27·7	1·7
1,650	40·5	5·3	52·5	4·3	87	5·2	134	14·5	54	3·3	54·9	3·3	72·3	4·2	69	3·6	—	—	36	3·2	77·1	4·9	80	2·4	—	—	58·7	3·7	39	2·7
2,200	46·5	8·9	60·5	7·5	105	12	125	11	55·7	3·9	60·5	5·2	82	6·5	75·5	5·6	87	6	42·5	5·6	81·1	78	86	4·7	—	—	75·2	4·6	48·7	3·9
3,300	90·2	20	96·9	19	157	15	100	8	62·9	7·9	70·2	9·1	111·5	11·8	95·1	9·8	111·5	11	62·3	13·5	108·8	17·4	90·2	10·8	—	—	102·6	6·1	64·6	6·9

So far as the English 13-pr. guns are concerned it must be understood that they are only in the experimental stage, and that before the pattern is definitely fixed they will be improved in many ways. These data, however, confirm very strongly what has been before said in this paper, as to the relative accuracy of breech and muzzle-loading guns. With regard to the columns for the 9-pr. and the 16-pr., they have been calculated from records of practice extracted from the published Proceedings of the Department of the Director-General of Artillery, and are approximate only.

TAB

Comparative Table of Austrian, English, French,

Principal dimensions, &c.	Austrian.		English.		French.	
	8 cm.	9 cm.	9-pounder.	16-pounder.	8 cm.	9 cm.
Calibre	2·95 in.	3·43 ins.	3 ins.	3·6 ins.	3·15 ins.	3·54 ins.
No. of grooves	24	24	3	3	24	28
Depth of grooves ...	·049 in.	·049 in.	...	...	·019 in.	·023 in.
Length of bore from muzzle to end of chamber	70·67 ins.	71·95 ins.	66 ins.	68·4 ins.	83·54 ins.	82·72 ins.
Ditto in calibres ...	24	21	22	16	26½	22½
Diameter of powder chamber	3·11 ins.	3·58 ins.	...	...	3·27 ins.	3·7 ins.
Length of ditto ...	10·04 ins.	13·78 ins.	...	...	16·34 ins.	21·97 ins.
Pitch of rifling	1 in 45 cals.	1 in 45 cals.	1 in. 30 cals.	1 in 30 cals.	1 in 120 to 1 in 25½	1 in 113 to 1 in 25½
Length of gun over all	76·77 ins.	81·17 ins.	71 ins.	74·45 ins.	89·76 ins.	89·76 ins.
Weight, including breech-closing apparatus	658 lbs.	1,071 lbs.	672 lbs.	1,344 lbs.	935 lbs.	1,106 lbs.
Service charge of powder	2 lbs. 1 oz.	3 lbs. 5 ozs.	1 lb. 12 ozs.	3 lbs.	3 lbs. 5 ozs.	4 lbs. 3 ozs.
Ratio of ditto to weight of shell	1/5	1/4·2	1/5·2	1/5·4	1/3·7	1/4·2
Muzzle velocity ...	1,385 feet	1,470 feet.	1,391 feet	1,350 feet	1,608 feet	1,492 feet
Length of common shell	...	...	7·93 ins.	10 ins.	8·98 ins.	10·08 ins.
Weight of ditto filled, with fuze	...	...	9·1 lbs.	16·2 lbs.	12·3 lbs.	17·6 lbs.
Weight of bursting charge	...	...	8 ozs.	16 ozs.	8·5 ozs.	10·5 ozs.
Length of double-skin ring shell	7·38 ins.	8·46 ins.	...	...	...	...
Weight of ditto filled, with fuze	10·4 lbs.	14 lbs.	...	...	...	...
Weight of bursting charge	3·5 ozs.	7 ozs.	...	...	...	...
Weight of shrapnel, with fuze	10·4 lbs.	15·6 lbs.	9·75 lbs.	17·9 lbs.	12·3 lbs.*	17·6 lbs.
No. of balls in ditto ...	105	165	63	128	...	92
Weight of one ball ...	35 to the lb.	35 to the lb.	25 at 18, 38 at 34 to the lb.	72 at 18, 56 at 84 to the lb.	...	...
Weight of bursting charge	1·6 oz.	3 ozs.	·75 oz.	1·5 oz.	...	7 ozs.
Weight of case-shot ...	10·4 lbs.	16·48 lbs.	9·75 lbs.	15·2 lbs.	12·8 lbs.	17·3 lbs.
No. of balls in ditto ...	72 hard lead	120 hard lead	110 hard lead	176 hard lead	85 hard lead	123 hard lead
Weight of one ball ...	10 to the lb.	10 to the lb.	16½ to the lb.	16½ to the lb.	10¾ to the lb.	10¾ to the lb.

LE A.

German, Italian, and Russian Field Guns.

German.		Italian.		Russian.			Remarks.
8 cm.	9 cm.	7 cm.	9 cm.	4 pr. H.A.	4 pr. F.B.	9 pounder.	
3·09 ins. 24 ·049 in.	3·46 ins. 24 ·049 in.	2·95 ins. 12 ·051 in.	3·43 ins. 24 ·049 in.	3·43 ins. 24 ·049 in.	3·43 ins. 24 ·049 in.	4·19 ins. 24 ·049 in.	
74·21 ins.	73·42 ins.	62·6 ins.	73·32 ins.	57·68 ins.	73·42 ins.	72·05 ins.	
24	21	21	21½	17	21½	17½	
3·62 ins.	3·94 ins.	3·11 ins.	*	3·86 ins.	3·86 ins.	4·63 ins.	*Not known.
9·49 ins.	9·49 ins.	12·72 ins.	14·8 in.	7·67 ins.	6·7 ins.	10·4 ins.	
1 in 50 cals.	1 in 50 cals.	1 in 46¾ cals.	1 in 45 cals.	1 in 36 cals.	1 in 40 cals.	1 in 36 cals.	
82·67 ins.	82·67 ins.	69·5 ins.	82·67 ins.	66·9 ins.	82·6 ins.	82·6 ins.	
858 lbs.	990 lbs.	650 lbs.	1,071 lbs.	802 lbs.	1,006 lbs.	1,370 lbs.	
2 lbs. 12 ozs.	3 lbs. 5 ozs.	1 lb. 14 ozs.	3 lbs. 3 ozs.	3 lbs. 0 oz.	3 lbs. 0 oz.	4 lbs. 1 oz.	
$\frac{1}{4}$	$\frac{1}{4·7}$	$\frac{1}{5}$	$\frac{1}{4·7}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{6·8}$	
1,525 feet	1,456 feet	1,381 feet	1,490 feet	1,350 feet	1,452 feet	1,225 feet	
...	...	...	...	...	...	...	
...	...	...	...	...	...	...	
...	...	...	...	...	...	...	
7·87 ins.	8·86 ins.	7·36 ins.	8·86 ins.	8·9 ins.	8·9 ins.	11·09 ins.	
11·2 lbs.	15·4 lbs.	9·35 lbs.	15 lbs.	15·1 lbs.	15·1 lbs.	27·5 lbs.	
7 ozs.	8·75 ozs.	6 ozs.	7 ozs.	7·2 ozs.	7·2 ozs.	16 ozs.	
12·2 lbs. 123	17·9 lbs. 210	9·24 lbs. 103	14·7 lbs. 177	15·1 lbs. 150	15·1 lbs. 150	27·5 lbs. 290	* Pattern not definitely settled.
27 to the lb.	27 to the lb.	25 to the lb.	25 to the lb.	19 to the lb.	19 to the lb.	19 to the lb.	
·66 oz.	·8 oz.	·46 oz.	·6 oz.	2·5 ozs.	2·5 ozs.	3·95 ozs.	
11 lbs.	16·5 lbs.	9 lbs.	15·7 lbs.	15·6 lbs.	15·6 lbs.	28·38 lbs.	
76 zinc	76 zinc	126 zinc	226 hard lead	102 zinc	102 zinc	171 zinc	
10 to the lb.	6 to the lb.	20 to the lb.	20 to the lb.	7½ to the lb.	7½ to the lb.	7½ to the lb.	

Table A—

Principal dimensions, &c.	Austrian.		English.		French.	
	8 cm.	9 cm.	9-pounder.	16-pounder.	8 cm.	9 cm.
Gun Carriages.						
Weight of gun-carriage equipped with gun	1,685 lbs.	2,259 lbs.	2,044 lbs.	2,957 lbs.	2,101 lbs.	2,662 lbs.
Diameter of wheel ...	54 ins.	54 ins.	60 ins.	60 ins.	56½ ins.	58½ ins.
Track	60¾ ins.	60¾ ins.	62 ins.	62 ins.	56½ ins.	60 ins.
Rounds carried on gun	...	...	4 case	4 case	...	...
Limbers.						
Diameter of wheel ...	54 ins.	54 ins.	60 ins.	60 ins.	56½ ins.	60 ins.
Weight of limber, packed	1,730 lbs.	1,840 lbs.	1,748 lbs.	1,897 lbs.	1,397 lbs.	1,738 lbs.
Rounds carried in limber—						
Common shell ...	...	...	8	6	21	18
Double-skin ring shell	24	20	...	...	...	...
Shrapnel ditto ...	12	10	28	18	7	7
Case	4	4	..	...	2	2
Total... ...	40	34	36	24	30	27
Ratio between weight of limber and weight of ammunition carried in it	2·46	2	3·43	3·35	2	2
Weight, complete, behind team	3,415 lbs.	4,246 lbs.	3,792 lbs.	4,784 lbs.	3,509 lbs.	4,422 lbs.
Number of horses ...	6	6	6	8	6	6
Number of men carried on gun	2	2	2	2	...	...
Ditto on limber ...	3	3	3	3	3	3
Weight per horse without gunners	570 lbs.	708 lbs.	632 lbs.	598 lbs.	585 lbs.	737 lbs.
Number of guns in a battery	8*	8	6	6	6	6
Number of waggons ...	8	8	6	6	9	9
Weight of ditto (with limber)	4,176 lbs.	4,589 lbs.	4,482 lbs.	4,621 lbs.	4,048 lbs.	5,038 lbs.
Number of horses ...	6	6	6	6	6	6
Weight per horse ...	696 lbs.	685 lbs.	747 lbs.	770 lbs.	675 lbs.	840 lbs.
Number of rounds in waggon—						
Common shell ...	...	...	24	18	69	53
Double-skin ring shell	78	65	...	...	...	...
Shrapnel ditto ...	24	20	84	54	21	21
Incendiary shell ...	6	5	...	...	...	...
Case	4	4	...	...	...	...
Total carried in waggon	112	94	108	72	90	74
Total number rounds per gun carried by the battery	152	128	148	100	165	138

continued.

German.		Italian.		Russian.			Remarks
8 cm.	9 cm.	7 cm.	9 cm.	4 pr. H.A.	4 pr. F.B.	9-pounder.	
1,898 lbs.	2,062 lbs.	1,531 lbs.	2,390 lbs.	1,802 lbs.	2,114 lbs.	2,574 lbs.	
55 ins.	55 ins.	50 ins.	58½ ins.	55 ins.	55 ins.	55 ins.	
60 ins.	60 ins.	53 ins.	60½ ins.	65 ins.	66 ins.	65 ins.	
1 case.	1 case	2 case	2 case	2 case	2 case.	1 case.	
55 ins.	55 ins.	50 ins.	58½ ins.	55 ins.	55 ins.	55 ins.	
2,062 lbs.	2,206 lbs.	1,205 lbs.	1,772 lbs.	1,774 lbs.	1,982 lbs.	2,046 lbs.	
...	...	...	...	...	...	...	
24	20	20	18	12	13	...	
12	10	18	17	15	15	...	
2	2	2	1	3	2	...	
38	32	40	35	30	30	18	
2·8	2·52	1·52	2·74	2·2	2·6	3·53	
3,960 lbs.	4,268 lbs.	2,744 lbs.	4,162 lbs.	3,692 lbs.	4,037 lbs.	4,620 lbs.	
6	6	4	6	6	6	6	
...	2	2	2	...	2	2	
3	3	2	3	3	3	3	
660 lbs.	711 lbs.	686 lbs.	694 lbs.	615 lbs.	673 lbs.	770 lbs.	
6	6	8	8	6	8	8	* 6 only in H.A.
8	8	8	8	9	12	16	
4,686 lbs.	4,928 lbs.	2,998 lbs.	4,504 lbs.	4,721 lbs.	4,721 lbs.	4,719 lbs.	
6	6	4	6	6	6	6	
781 lbs.	821 lbs.	750 lbs.	751 lbs.	787 lbs.	787 lbs.	787 lbs.	
...	...	...	...	...	...	...	
60	55	50	48	42	43	...	
24	20	48	47	45	45	...	
...	...	...	...	...	...	...	
2	2	2	1	3	2	...	
86	77	100	96	90	90	54	
154	136	140	131	165	165	165	

TABLE C.

Comparative Table of the most recent productions in Field Artillery.

Principal Dimensions, &c.	Armstrong.			Krupp.			Vavasseur.		Woolwich.	
	9-pounder B.L.	13 pounder B.L.	7-pounder M.L.	7·5 cm. B.L.	9·6 cm. B.L.	6·5 cm. B.L.	10-pounder B.L.	13-pounder B.L.	13-pounder M.L.	13-pounder B.L.
Calibre	2·6 ins.	3 ins.	2·5 ins.	2·95 ins.	3·78 ins.	2·56 ins.	2·95 ins.	3·15 ins.	3 ins.	3 ins.
No. of grooves	16	10	8	24	36	16	40	24	10	13
Depth of ditto	·013 in.	·025 in.	·05 in.	·049 in.	·049 in.	·039 in.	·02 in.	·02 in.	·05 in.	0·5 in.
Length of bore from muzzle to the end of the powder chamber	75 ins.	80 ins.	66·5 ins.	70·67 ins.	88·78 ins.	65·36 ins.	74·21 ins.	94·5 ins.	84 ins.	84 ins.
Ditto in calibres	2·9	27	26½	24	23½	25½	28½	30	28	28
Diameter of powder chamber	3·5 ins.	3·7 ins.	2·56 ins.	3·35 ins.	4·17 ins.	3·11 ins.	3·46 ins.	3·6 ins.	3·15 ins.	3·5
Length of ditto	10·05 ins.	11·78 ins.	10·75 ins.	8·66 ins.	13·18 ins.	7·08 ins.	7·36 ins.	16·7 ins.	14·13 ins.	11·5 ins.
Pitch of rifling	1 in 100 cals. to 1 in 35 3 ins. from muzzle.	1 in 100 cals. to 1 in 30 at 7·94 ins. from muzzle.	1 in 80 cals. to 1 in 30 at the muzzle.	1 in 36 cals.	1 in 25 cals.	1 in 25 cals.	1 in 25 cals.	0 to 1 in 25 cals	1 in 100 cals. to 1 in 30 at 9 ins. from muzzle.	1 in 30 cals.
Length of gun over all	84·2 ins.	90 ins.	70·45 ins.	78·74 ins.	98·43 ins.	70·87 ins.	83·7 ins.	104 ins.	92 ins.	89 ins.
Weight with breech closing apparatus	532 lbs.	929 lbs.	400 lbs.	660 lbs.	1,375 lbs.	396 lbs.	1,008 lbs.	1,064 lbs.	896 lbs.	952 lbs.
Service charge of powder	2 lbs. 8 ozs.	3 lbs. 8 ozs.	1 lb. 8 ozs.	2 lbs. 3 ozs.	5 lbs. 8 ozs.	1 lb. 10 ozs.	2 lbs. 13 ozs.	6 lbs.	3 lbs. 2 ozs.	3 lbs. 2 oz.
Ratio of ditto to weight of shell	1 / 3·6	1 / 3·7	1 / 4·6	1 / 4·3	1 / 4·8	1 / 5·46	1 / 4	1 / 2·2	1 / 4·2	1 / 4·2
Muzzle velocity	1,530 ft.	1,600 ft.	1,440 ft.	1,525 ft.	1,443 ft.	1,365 ft.	1,673 ft.	1,904 ft.	1,595 ft.	1,595 ft.
Length of shell	8·5 ins.	9·98 ins.	7·93 ins.	7·28 ins.	12·44 ins.	8·66 ins.	8·5 ins.	9·6 ins.	10·64 ins.	9·5 ins.
Weight of ditto filled, with fuze	9 lbs.*	13 lbs.†	7·38 lbs.	9·46 lbs.	26·4 lbs.	9 lbs.	11 lbs.	13 lbs.	13·25 lbs.	13 lbs.
Weight of bursting charge	4·75 ozs.	8 ozs.	4 ozs.	3·5 ozs.	12·67 ozs.	2·5 ozs.	8 ozs.	9 ozs.	10 ozs.	6·5 ozs.
Weight of shrapnel with fuze	9 lbs.	13 lbs.	7·38 lbs.	9·46 lbs.	26·4 lbs.	9 lbs.	...	...	13·25 lbs.	13 lbs.
No. of balls in ditto	140 balls 12 segments	216 balls 12 segments.	56 at 26 and 18 at 32 to the lb. and 10 segments.	100 hard lead.	295 hard lead.	125 hard lead.	...	...	116 hard lead.	138, 24 to the lb., or 98, 34 to the lb.‡
Weight of one ball	35 to the lb.	35 to the lb.	...	30 to the lb.	30 to the lb.	40 to the lb.	...	...	34 to the lb.	
Weight of bursting charge	1 oz.	1 oz.	·5 oz.	2 ozs.	6·34 ozs.	1 oz.	...	...	·75 oz.	
Weight of case shot	9 lbs.	13 lbs.	7 lbs.	9·24 lbs.	26·4 lbs.	9 lbs.	...	...	13·56 lbs.	13 lbs.

* Also fires a segment shell of the same weight; bursting charge 1 oz., number of segments 54.

‡ Also fires a segment shell of the same weight; bursting charge 1 oz., number of segments 70. ‡ Two different patterns.

Table C.—*continued.*

Principal Dimensions, &c.	Armstrong.			Krupp.			Vavasseur.		Woolwich.	
	9-pounder B.L.	13-pounder B.L.	7-pounder M.L.	7·5 cm. B.L.	9·6 cm. B.L.	6·5 cm. B.L.	10-pounder B.L.	13-pounder B.L.	13-pounder M.L.	13-pounder B.L.
No. of balls in ditto ...	108 hard lead	156 hard lead.	78 hard lead.	69 zinc.	125 zinc.	75 zinc.	...	...	285 mixed metal.	340 mixed metal.
Weight of one ball ...	16½ to the lb.	16½ to the lb.	16½ to the lb.	11 to the lb.	6 to the lb.	10 to the lb.	...	...	34 to the lb.	34 to the lb.
Carriages.										
Weight of gun carriage equipped with gun	1,456 lbs.	2,184 lbs.	931 lbs.	1,672 lbs.	2,563 lbs.	794 lbs.	...	...	2,234 lbs.	2,382 lbs.
Diameter of wheel	54 ins.	60 ins.	36 ins.	54 ins.	54 ins.	39 ins.	...	...	60 ins.	60 ins.
Track	60 ins.	62½ ins.	36 ins.	60 ins.	60 ins.	31 ins.	...	...	62 ins.	62 ins.
Rounds carried on gun	4 case.	4 case.	...	...	...	...	...	...	...	2 case.
Limbers.										
Weight of limber packed ...	1,305 lbs.	1,673 lbs.	...	1,610 lbs.	1,947 lbs.	...	...	...	1,894 lbs.	2,072 lbs.
Rounds carried in limber—										
Common shell	8	12	12*	...	...	...	...	...	8	16
Ring shell	...	...	...	24	15	...	...	...	...	...
Segment	16	16	...	...	...	...	...	...	...	...
Shrapnel	12	12	30*	12	5	...	...	...	26	18
Case	...	4	6	2	2	...	...	...	2	2
Total...	36	44	48	38	22	...	...	...	36	36
Weight complete behind team...	2,779 lbs.	3,857 lbs.	...	3,282 lbs.	4,510 lbs.	...	...	...	4,128 lbs.	4,466 lbs.
Weight per horse without gunners, at six horses per gun	463 lbs.	643 lbs.	...	547 lbs.	752 lbs.	...	...	...	688 lbs.	744 lbs.

* Per gun on mules.

BELGIUM :—ARMY AND DEFENSIVE SYSTEM.

Translated from the *Revue Militaire de l'Etranger*. By Captain H. C. Reynolds, D.A.Q.M.G., Intelligence Branch, Quartermaster-General's Department.

Starting from the points where the frontiers of France and Germany are conterminous we find these two countries are separated by two small States, Belgium and Switzerland, of which the neutrality is guaranteed by treaty In the event of war between the two great countries (France and Germany) both would have their flanks covered, under the condition that the treaties of neutrality were respected. Long before the war of 1870, the case of the violation of these neutral territories had been examined in various plans of campaign, notably in the well-known memorandum of Marshal v. Moltke ; since that time the same hypothesis has been examined abroad, by military writers, sometimes from a general and theoretical point of view, sometimes with a view to a particular case.

These discussions have not a little contributed to fix the attention of Switzerland on the question of fortifications. This question is now actually in course of being studied in official quarters, after having been the subject of much discussion in the papers, during which the example of Belgium has been frequently cited. While waiting the solution among our neighbours on the other side of the Jura, it may be interesting to inquire into the resources which Belgium has at her command for compelling a respect for her neutrality.

In the absence of official data some valuable information may be found in the work of a military writer whose name will not be new to our readers, Captain Plantenga, Professor of Military Art and History in the Military Academy of Breda, who has in a recent work[1] described the organization of the Belgian army on a war footing, and the system of defence adopted for Belgium. We will give a *résumé* of this portion of the work of Captain Plantenga (taking his authority for granted) after we have briefly sketched the composition of the Belgian army in ordinary times, the measures for assuring the effective strength on a war footing, and lastly the preparatory dispositions for the rapid mobilization of the army.

Composition of the Army on Peace Footing.

The organization of the army now in force dates from 16th August, 1873 ; the composition of the corps of various arms on peace footing was fixed by royal decree 29th January, 1874. The following are combatant troops only.

Infantry.

1 regiment of carabineers.
1 „ grenadiers.
3 „ chasseurs, numbered 1 to 3.
14 „ line, numbered 1 to 14.
1 corps of discipline and punishment.
3 stationary companies formed of men not fitted for active service.

The regiment of carabineers has 4 active battalions, and two[2] non-active battalions ; all the other regiments have each three battalions and one non-active battalion. In addition, each regiment has a depôt company.

Each battalion has 4 companies.

[1] "Militaire aardrijks kunde en statistick von Belgie," 1877.

[2] The non-active battalions have only a "cadre," each of their companies having 4 officers and 13 men ; the remainder are on unlimited leave.

Cavalry.

2 regiments chasseurs-à-cheval.
2 „ of guides.
4 „ of lancers.

Each regiment has 4 squadrons (active), and 1 squadron of reinforcement, numbered from 1 to 5.

Artillery.

This arm comprises a staff, and the following troops :—

4 field regiments, numbered 1 to 4.[1]
3 siege regiments, numbered 5 to 7.
1 company of pontoniers.
1 „ artificers.
1 „ workmen.
1 „ armourers.

The 1st and 3rd Regiments have each 8 batteries (field), and 2 batteries of reserve, which act as a depôt.

The 2nd and 4th Regiments have each 7 field batteries, 2 horse artillery batteries, and 1 battery of reserve, acting as a depôt.

The field batteries are numbered 1 to 40 in order of regiments ; the 18th, 19th, 38th, and 39th are horse artillery batteries.

Each battery horses 6 pieces, except the reserve batteries, which are only horsed in time of war.

The 5th, 6th, and 7th Regiments have each 16 siege batteries, 1 reserve, and 1 depôt battery. The siege batteries are numbered 1 to 48 in order of regiments. The reserve and depôt batteries are not numbered.

Engineers.

The engineers comprise a staff and the following troops.

1 regiment (3 battalions, of 4 companies each and a depôt), 5 special companies, 1 railway company, 1 field telegraph company, 1 garrison telegraph company of artificers, 1 of pontoniers, 1 of workmen.

Train.

The train has a battalion of 7 companies, of which 4 are for the pontoon train, engineers and parks, 2 for commissariat train and ambulances, and 1 depôt company.

Distribution of Troops.

On a peace footing the infantry is distributed in 4 divisions, each of 2 brigades, except the 4th, which has 3 brigades. The head-quarters of divisions are at Ghent, Antwerp, Liége, and Brussels.

The cavalry forms 2 divisions (each of 2 brigades) with head-quarters at Brussels and Louvain.

The field artillery consists of 2 brigades, and the siege artillery of

[1] During the last few years it has been the object to replace the field guns of 8 c. and 9 c. by Krupp guns of 7 c. 5 and 8 c. 7, which are much more powerful. In 1877, two general officers and a colonel of artillery were sent to Meppen to take part in the experiments made with these last pieces. The Commission decided in favour of their adoption. Consequently, a credit of 3,300,000 frs. was voted by the Chambers, in May, 1878, for the purchase of 20 batteries. These guns are on the Prussian model of 1873, with two slight modifications in the vent, and in the length of the rifling. Owing to accidents to the carriages during trial, these Krupp batteries had to be sent back to Germany for repair.

1 brigade. The Inspection-General of the artillery is at Brussels, as is also that of the engineers.

Armament.

To complete this account of the permament army in time of peace, we will add the following items on the armament of the troops.

The rifles (carabineers) are armed with the Terssen rifle (model 1868) to which is fixed a sword-bayonet, and all the other regiments of infantry have the Albini rifle (model 1867), with a bayonet of triangular section in the blade: the extreme range to which these rifles are sighted is 1,300 metres (1,422 yards.)

The chasseurs-à-cheval and guides are armed with the Comblain carbine (model 1870), extreme range 500 metres (547 yards).

The engineers are armed with the Terssen rifle with saw-bayonet.

All these arms are breechloaders: have a calibre of 11 metres (·433 inch), and the same cartridge; weight of charge 5 grammes, weight of ball 25 grammes, cartridge case 43 grammes.

The cavalry cartridge is a little shorter than the others, and contains only 4 grammes of powder.

All troopers and mounted artillerymen have a pistol, which it is intended shortly to have replaced by a revolver.

General Effective Strength.

Since 1869 the annual contingent of the active army has been fixed at 12,000 men; but as in practice, owing to casualties, the incorporated contingent only reached exceptionally 11,400 men, it was determined from 1879 to frame the law in such a manner that the contingent at the disposition of Government should be 12,000 *effectives.*

The effective strength fixed by the budget on a peace footing (exclusive of the gendarmerie) averages 45,000 men, and 9,000 horses.

The following table extracted from the "Annuaire Statistique" of Belgium for 1879 shows the effective strength of the army in officers, men with the colours, and men on furlough in 1878.

Arm.	Officers.	Men.		Totals of two Columns.
		Paid.	Without Pay.	
Infantry	1,817	25,217	45,549	71,766
Cavalry	364	5,803	2,536	8,339
Artillery	422	7,569	9,536	17,105
Engineers	86	1,416	1,725	3,141
Gendarmerie, train, administration, staff	617	3,153	3,909	7,062
Totals	3,306	43,158	64,255	107,413

By the terms of Article 3 of the law of recruitment called "law of the "milice" of 1870—1873, the King can, in case of war, or when the territory is threatened, call into activity the number of classes on furlough (congediées) that he considers necessary, beginning with the last. This provision was only to remain in force till 1st January, 1880; it was hoped that at that date a national reserve would have been established, the principle of which had been

allowed since 1868. The "Belgique Militaire" of 21st March, 1880, announced that this reserve not having yet been constituted, a bill has been presented to the legislature which is destined to modify the law of recruitment (above mentioned), and provides that the King amongst other regulations shall have the power, up to the end of 1880 of calling up the ninth and tenth classes; this paper insists on the fact that the King at the present moment has at his disposition only eight classes, which would not furnish more than 75,000 men.[1]

In 1870 the ninth and tenth classes (of which the bachelors alone are recalled in case of mobilization) showed an aggregate of 14,400 casualties on a total of 20,000 enrolled; that is, they amounted to 60 per cent.

There is no law to determine in a general way the effective strength of the army on a war footing. The Chambers, according to the terms of Art. 119 of the Constitution of 7th February, 1831, settle the total annual contingent which since 1869 has been fixed at 100,000 men each year.

Mobilization.

In case of mobilization, the recall of men on unlimited furlough becomes the duty of the lieutenants and sub-lieutenants of gendarmerie, in command of the 32 military districts of the territory; these officers are assisted by the sub-officers or corporals of gendarmerie, commanding the cantons,[2] to the number of 303.[3]

The district commandants keep up the registers of men on unlimited furlough; the commandants of cantons keep up the nominal rolls, by communes, of the men on unlimited furlough, who each year in the month of November are inspected by the commandant of the district to which they belong.

The objects of this inspection are:—

1st. To make sure that the men are present.
2nd. To see the state of the equipment in their possession.
3rd. To verify the correctness of the lists and registers kept by Commanding Officers of corps, the Commandants of cantons and the burgomasters.
4th. To bring forward, for retirement, men unfit for service.
5th. To instruct the men in their duties on mobilization.

By the terms of the royal decree of 7th August, 1877, and of the ministerial explanatory circular of 15th of the same month, the men are recalled to the colours either by *orders of recall* (*ordres de rappel*) stating the date, the day of the week, the hour and place of assembly in the commune, or by orders to rejoin (ordres de rejoindre). The former apply only in case of mobilization for the recall of men on unlimited furlough, are drawn up on *blue paper* by the District Commandants, and form portion of the records of their offices; the latter, which are specially intended for time of peace, are made out by

[1] The duration of service in peace is 8 years, dating from the 1st October of the year of incorporation, with a time under the colours, varying according to the arm from 2 to 4 years. Nevertheless, after these 8 years, the men remain borne on the rolls for two years before receiving their permanent furlough. It is the power of applying this last provision which it is a question of continuing up to 1st January, 1881.

[2] The "canton de milice" is a subdivision of the "arrondissement administratif," one of the civil divisions of the country. The "commune" is a further subdivision of the "canton du milice."

[3] The budget of the gendarmerie for the financial year 1881, is based on an effective strength of 1,965 men and 1,345 horses. On 30th January of the present year the effective strength of the officers of gendarmerie was as follows—1 colonel, 1 lieutenant-colonel, 3 majors, 10 captains, 12 lieutenants, 22 sub-lieutenants.

Commanding Officers of corps on *white* paper, and sent by them to call up to the colours those men who are on limited furlough.

The *order of recall* states that the man is to furnish himself with rations for the day, and that if he arrives with a good pair of boots, he will be permitted to wear them in the ranks.

As soon as the District Commandants receive notice by telegram that mobilization is ordered they complete the "*ordres de rappel*" by entering on them the date and day of the week for the assembly of the men at the commune, and have them sent at once to the Commandants of cantons (with the ministerial instruction for the burgomaster and Commandants of cantons), by the gendarmes of the chief towns of that district. These orders, as well as the instructions intended for burgomasters, are placed in the hands of the communal authorities by the gendarmes of the cantons.

In the absence of gendarmes, or in case they are not in sufficient number, the Commandants of districts and cantons are authorised to employ government servants, such as postmen, custom-house officers, &c., and in the absence of these, trustworthy and intelligent messengers, who are entitled to be paid at the rate of 95 c. or 1 fr. 90 c. per league of 5 kilos. according as the journey is made on foot or on horseback. In each district a table is kept showing the routes to be followed by all messengers going to the cantons or communes, as well as the time employed on the journey.

The gendarmes or messengers pass these *ordres de rappel* to the burgomasters, who hand them to the persons interested, and at the same time by posters and placards on the public highways give notice that all men on unlimited furlough are recalled to the colours, and should be by such a day, and at such an hour, at the point of assembly mentioned; the excuse of ignorance is not admitted.

To avoid all delay in the transmission of *ordres de rappel*, these are arranged in packets by communes, the packet bearing the address of the burgomaster; they are then enclosed in a cover addressed to the Commandant of the canton. An explanatory circular of the Minister of War and a receipt, are placed in each of the packets destined for the burgomaster and the Commandants of cantons.

The men are collected through the agency of the communal authority, and are then conducted to the station they are to start from by the Commandant of the canton, to be sent to the depôts, where they are equipped, armed, and clothed: the clothing being the property of the man, and being kept at the depôt, there is no difficulty in the distribution at the moment of *rappel*. If for any reason the men cannot be put into the train at the station indicated, they are to be marched by the ordinary routes to the depôt, or else taken to some station close by; the Commanders of detachments, and the Commandants of cantons are therefore authorized to requisition the necessary means of transport, as well as food and lodging from the inhabitants.

From the time mobilization is ordered, military men of all ranks whether travelling alone, in detachments, or in corps, whether in uniform or not, are entitled to a free passage on all lines of railway on the presentation of their order to march, of their furlough, or of any document establishing their identity; no administrative formality can be required of Commanding Officers of corps, or detachments travelling by rail.

The men travel according to the number by ordinary or by special trains; special time tables are prepared in time of peace, and to avoid any loss of time whatever, or any useless expenditure of labour, the points of assembly and concentration, as well as the stations of embarkation, have been laid down in such a manner that all the details of the movements relate to a general concentration towards the depôts.

Men on unlimited furlough cannot travel, or go abroad, to stay or reside, except by special authorization from the War Department, and on the condi-

tion that they give notice to their burgomaster of the route they intend to take in travelling, and the probable date of return, or of their intended place of residence; they are bound to return to Belgium when their class is first called up on the army being mobilized; in the *ordre de rappel* destined for them, the date, hour, and place of assembly are replaced by the words "immediately "and directly to the depôt of the corps at . . . ."

The organization of the army does not include a reserve of officers.

A general plan of mobilization was adopted during the years 1876 and 1877, it indicates day by day the measures necessary for completing the effective strength in men, horses, &c., and for concentrating the army in positions selected beforehand. There is also a general explanatory circular (Instruction générale) on the mobilization of the army, bearing date 20th February, 1878. This as well as the general plan of mobilization (above mentioned) is confidential. The latter forms part of the documents kept up by regulation in every company, squadron, or battery.

As regards the horses required to complete the establishment on mobilization, recourse must be had to purchase, as there is no law on the requisition of horses in Belgium. When the Belgian army was mobilized in 1870,[1] "the "cavalry and artillery were short of 6,800 horses, and after 27 days' exertion "by Officers scouring the provinces, only 4,140 could be obtained." If we consider moreover that harness was wanting for the ammunition columns, the commissariat and the ambulance, it must be admitted that the situation was most embarrassing.

It is probable that the infantry would complete its effective strength by the fourth day, the cavalry and artillery by the ninth day, the train and other services by the fifteenth day.

(The remainder of the article consists of extracts from the work of Captain Plantenga.)

Organization of the Army on a War Footing.

In time of peace the Belgian army is divided into 2 principal groups:—

1st. The army of operations.
2nd. The army of Antwerp.

1*st. The Field Army (or Army of Operations).*

This will include:—

4 divisions (divisions de ligne) formed into 2 corps d'armée, and a 5th division constituting, with the division of lancers (4 regiments), the general reserve of the army; this 5th division only becomes available (disponible) after the mobilization of the active civic guard.[2]

[1] Forces nationales V. d. Smissen.

[2] *Organization of the Civic Guard.*

The civic guard is organized by communes, and formed into companies, battalions, and legions; it is divided into—

(1) *The Active Guard* in communes having an aggregate population of more than 10,000, in fortified towns, or towns commanded by a fortress.

(2) *The Non-active Guard* in other communes. The latter only consists of a cadre.

It is placed in time of peace under the control of the Minister of the Interior; in time of war the mobilized civic guard (the organization of which is then subject to a special law) is placed under the Minister of War.

All Belgians and strangers allowed to reside in Belgium, between the ages of 25 and 50, are subject to service in the civic guard.

The active "gardes" may (in addition to two annual inspections) be exercised in the management of their arms or in drill evolutions 8 times a year, the duration of each

Each division will be composed as follows:—

2 brigades of infantry, 12 battalions.
1 battalion of the Rifle Regiment.
1 regiment of cavalry of 4 squadrons.
4 batteries of field artillery, 24 guns.
1 ammunition column.
I company of Engineers.
1 division of the train.
1 company of administration.
1 ambulance.
I detachment of gendarmerie.

drill being at the outside two hours. Members of the guard considered sufficiently instructed, and those who have completed their 35th year, cannot be subjected to more than one drill a year, unless they belong to a special corps.

The Officers (titulaires des grades) in each company are elected by the company; the battalion commanders, the surgeons, and assistant-surgeons of the battalion are elected by the officers of the battalion; the surgeon of the "légion" and the ensign (lieutenant porte drapeau) are chosen by the officers of the "légion." The other officers are nominated by the King from a triple list of candidates, which is presented by the elected officers. The Inspector-General, as well as the officers of the central staff (Grand État Major), the chief commandants (commandants supérieurs), and the officers of their staffs, are also nominated by the King.

The effective strength of a company of infantry varies from 60 to 150 men, not including officers and non-commissioned officers, the battalion consists of from 3 to 6 companies, and the legion of 2 to 4 battalions. The troops (pelotons) of cavalry have an effective strength of 25 to 36 men, including officers and non-commissioned officers, with a minimum of 80 men per squadron.

Each section of artillery consists of 30 to 40 men, including officers and non-commissioned officers; the battery has an effective strength of at least 60.

The cavalry and artillery may not include more than one-fortieth of the effective strength per commune.

The special corps of the civic guard are armed with a breechloading rifle on the Comblain system, calibre 11 mm., weight of charge 5 gr., weight of ball 25 gr., weight of cartridge 42 gr., initial velocity 400 metres. The rifle is fitted with a sword-bayonet (couteau de chasse). The infantry are still armed with the old flint gun converted, but it is intended to give them the Comblain rifle.

On the 31st March, 1879, the active civic guard included:—

		Men.
1st.	22 legions of infantry	21,284
	A certain number of battalions with	4,352
	A company of 103 at Namur	103
		25,739

In time of war the infantry would probable be formed into 50 battalions.

2nd.	Special corps, viz.:—	
	Chasseurs éclaireurs	1,433
	Chasseurs belges	182
	Artillery	1,562
	Cavalry	366
	Firemen	211
		3,755
	Total	29,494

To which may be added a company of chasseurs éclaireurs, formed at Charleroi by royal decree of 27th May last.

The effective strength of the non-active civic guard is 90,000 men.

The 5th Division will contain :—

The non-active battalions of the first 6 regiments of the line.
The 5th battalion of the Rifle Regiment.
The 3rd Regiment of Chasseurs-à-pied.
The regiment of grenadiers.
Four field batteries.

The 4 first squadrons of each of the 8 regiments of cavalry are completed on mobilization by the 5th squadron (of reinforcement) which then becomes a depôt squadron.

The 20 mounted *field* batteries of the 1st and 3rd Regiments of field artillery form the divisional artillery ; the 2nd Regiment of artillery (8 field and 2 horse artillery batteries) forms the corps artillery of the 1st Corps d'armée ; and the 4th Regiment (same composition), will form that of the 2nd Corps d'armée.

The effective strength of a company of infantry on a war footing is on an average 250 ; that of the squadron remains the same as the effective peace organization (140 men and 132 horses) ; the mounted field batteries and horse artillery batteries horse 6 guns each, as on a peace footing.

The effective of the companies of the train would have to be considerably increased in case of mobilization, as the number of men of the train on unlimited furlough is quite inadequate. With this view the oldest classes, which belong to the cavalry, will pass to the train if not required to complete the squadrons. The following belong to the field army :—

1 company of pontoniers.
1 company of telegraphists.
1 railway company.

The field army will amount to :

53,000 infantry.
7,000 cavalry and 240 guns.

The proportion is thus as follows :—Infantry to cavalry $7\frac{1}{2}$ to 1, with 4 guns per 1,000 infantry and cavalry.

2nd. The Army of Antwerp.

The 20 non-active battalions are destined in case of mobilization to occupy Antwerp, and other fortified points ; it is as well to bear in mind that the non-active battalions of the first 6 regiments of the line, and the 5th battalion of Rifle Regiments, are merged in the 5th division of the field army, as soon as it becomes possible to supply their place by the battalions of the civic guard. In case of need, the 13 non-active battalions remaining may be formed into a *sixth* division of infantry, but this also would be only possible if the civic guard took their place in the garrisons.

The army of Antwerp includes, in addition, all the other troops of the army, viz. :—

The depôts of the different arms.
The fortress artillery.
The engineers and special companies when these latter do not form part of the field army.
Total, 44,000 men.[1]

[1] According to the statement of Government, 45,000 men are destined to secure the position of Antwerp, and 45,000 men form the Field Army. 45,000 men would suffice to secure Antwerp, the forts of the intrenched camp, and those of the Lower Scheldt ; but independently of Antwerp, there are Diest, Termonde, and several citadels which will absorb 8,000 or 10,000 men.—*Le Pays et l'Armée. General Gœthals*, 1878.

Effective War Strength of the Belgian Army.

The effective strength on war footing amounts to about 104,000 of the following composition :—

Staffs	1,900
Intendance	206
Infantry	75,541
Cavalry	7,600
Field artillery	11,009
Siege „	3,029
Special arms	3,010
Administration and train	1,388
	103,683

with 13,800 horses and 240 field guns.

(This estimate differs only very slightly from that given in the "Annuaire "Statistique" for the year 1879.)

General Renard, before the Chamber of Representatives in 1878, stated that the result of the organization of 1873 would give 51 generals, 3,503 officers, 106,988 sub-officers and soldiers.

System of Defence of the Territory.

Since the year 1859, Belgium has changed the old defensive system which, consisting as it did of a great number of small fortresses, was in opposition to the true principles of military art, and had no relation to the number of men disposable in case of war. The fortifications of Ostende, Nieuport, Ypres, Menin, Tournai, Mons, Charleroi, Ath, Namur, Philippeville, have been razed ; on the other hand the defensive works of Antwerp have been extended and improved, so that the intrenched camp of Antwerp may be now said to be one of the best in the world. The following works have been retained.

i. The tête-de-pont of Termonde on the Scheldt.

ii. The citadel of Namur, and the 2 forts near Liége on the Meuse.

iii. The small fortress of *Diest* (finished in 1838), between the Meuse and Scheldt on the line of operations which resting on the Meuse from Liége to Maestricht aims at Brussels and Antwerp. The citadel of Ghent was dismantled in 1870.

This radical reform of the system of defence was made with the object of concentrating the defence, and rendering it suitable to the forces of the country.

The object has been to release the field army from the necessity of finding garrisons for a great number of small fortresses. With this view they have been replaced by a vast central réduit into which the army can, if necessary, retire before superior forces. From this position the army will be able to oppose either of the frontier States which should desire to take advantage of the position of the country, and Belgium may thus on all occasions assure the maintenance of her neutrality.

The considerations which have led to the selection of Antwerp, and not Brussels, as the central réduit, are partly *political* and partly *military.*

Politically speaking, it was rightly considered that Brussels has not, as regards Belgium, the importance which other capitals have in countries where the government is more centralized. The commercial and industrial towns

[2] In Belgium, the studies of the Staff in view of probable wars are simplified, for the method of concentration in all cases is the same; the object is to unite the army between Termonde and Diest, the left towards Hasselt and the Campine, the right thrown forward into the valley of the Dendre, so as to rest on the defensive position of Antwerp, and to be able thence to operate in the direction of the menaced frontiers.—*Notes sur le service des Etat-Majors Lahure.*

close by—Liége, Ghent, Bruges, and Antwerp, but Antwerp above all—are also great centres of importance. It would be easy to show, by reference to history, that at all times Antwerp has been considered in a military point of view the key of the country. It has been urged also, that Belgium is too small in size, too devoid of natural lines of defence, to be able to contend by herself against either of her powerful neighbours. If war breaks out, the army should choose a position favourable for defence against superior numbers, and await assistance from one at least of the Powers guaranteeing the neutrality of Belgium. This last consideration points to the choice of a position for the "réduit" of such a nature as to facilitate as much as possible the junction of the Belgian army with the army of that country on the support of which it has the best right to count.

This Power is England, whose interest it is to prevent Antwerp from belonging either to France or Germany, and since the time of Edward III, English statesmen have always sought to act with this view. Brussels, on the other hand, is of much less importance to England, because this town in the hands of the French would not be, according to the saying of Pitt, "a loaded "pistol pointed at the heart of England." The junction of an English army of relief with a Belgian army shut up at Brussels would moreover be easily frustrated by the enemy. Antwerp is a favourable point of disembarkation for an English army, and would be also far preferable to Brussels if it were a question of uniting the Dutch and Belgian forces. From a political point of view, therefore, the great town on the Scheldt deserves the preference. By establishing there the centre of the defence of the country the fortunes of Belgium were for ever united to the political interests of England, the natural ally of the Belgians. There are also many cases in which Antwerp would receive succour either from France or Germany, as easily as Brussels. The only advantage the latter possesses over Antwerp is that it is the seat of Government.

Many times has the *strategical* importance of Antwerp been disputed, for the reason that it is not in the centre of the country, and is too far from the line of operations by Givet or Charleroi—Liége—Aix la Chapelle—Cologne, on which the French and German armies, marching across Belgium, would most probably come in contact. If it be added that Antwerp is only one day's march further from Liége than Brussels; that the Belgian army, in the case contemplated, would take position in front of Antwerp, behind the Nethe and between Lierre and Malines, it is clear that Antwerp has about the same value as Brussels for the purpose of taking in flank a line of operations along the banks of the Meuse.

The distance from Brussels to Liége, by Louvain and Thienen, is 99 kilos.; from Antwerp to Liége, by Lierre, Aerschot, Diest, and St. Trond, is 120 kilos.; Lierre is 15 kilos. to the west of Antwerp; from Brussels to Namur is 62 kilos.; from Antwerp to Namur, by Malines and Louvain, 99 kilos.

As compared with Brussels, Antwerp has many other advantages. The first condition which every central réduit should satisfy is to assure the means of subsistence to the army which is to be sheltered. Communication with the capital might easily be cut off soon after the declaration of war, and the stores of provisions sent by rail and canal intercepted.

Moreover, Brussels has no important trade in corn, cattle, or colonial produce, and it may be assumed that after the first week's investment, the army and the inhabitants would begin to suffer privations. With Antwerp it is very different. In the first place, it has 40,000 fewer inhabitants than Brussels, and therefore a more limited consumption; as a commercial town of the first class, Antwerp always contains large stores of grain, rice, preserved meat, colonial produce, wine, oil, butter, cloth, iron, timber—in a word, resources of every kind, which not only facilitate the feeding of the inhabitants, but also conduce largely to an obstinate defence. Moreover, Antwerp

is on the borders of the rich and fertile country of Waes (on the left bank of the Scheldt) and can therefore be completely provisioned in a few days.

Again, Antwerp is more difficult to invest than Brussels: first, from its situation on a great river; and, secondly, because the town can be partially protected by inundations. From this it follows that an enemy is considerably limited in his choice of a front of attack, and that the defence of Antwerp, which can be secured by a smaller number of forts (than Brussels), will allow of a reduction of *personnel* and *matériel* for the purpose. On the perimeter of the intrenched camp of Antwerp, which measures 45 kilos., there are in fact only six fronts, including a total length of 14 kilos., along the line of forts which are open to a regular siege; while Brussels, turned into an intrenched camp, would be exposed to a gradually developed attack at almost all points, and each front would have to be of equal defensive strength, which is not the case at Antwerp. The fortification of the capital would therefore have entailed a much greater expense. If we take into consideration that the works of Antwerp have already cost 70 or 80 millions of francs, and are still incomplete, it is evident that the extra expense which would have been necessitated for the defensive works of Brussels is an important argument against the capital.

Lastly, it may be remarked, that in case of war breaking out suddenly, the concentration of the army in the position at Antwerp would be safer than at Brussels. Antwerp is further than Brussels from the southern and eastern frontiers, which are the most threatened, and there are zones of defence to the south-east of Antwerp (the Nethe, Dyle, Rupel), where the enemy might be delayed for some time. In front of Brussels there is nothing of the kind.

The citadel of Namur and the forts near Liége have been retained, because the principal points of passage[1] of the Meuse are in the neighbourhood of these places, and because there are important junctions on the lines of railway at those points. Liége in particular, setting aside the great military value which the town owes to its manufacture of arms, has a great strategical importance. The lines Cologne, Brussels, Antwerp, and Cologne, Aix-la-Chapelle, Charleroi, cross the river here. The old forts of Liége and the citadel of Namur may therefore be considered delaying or frontier forts (forts d'arrêt).

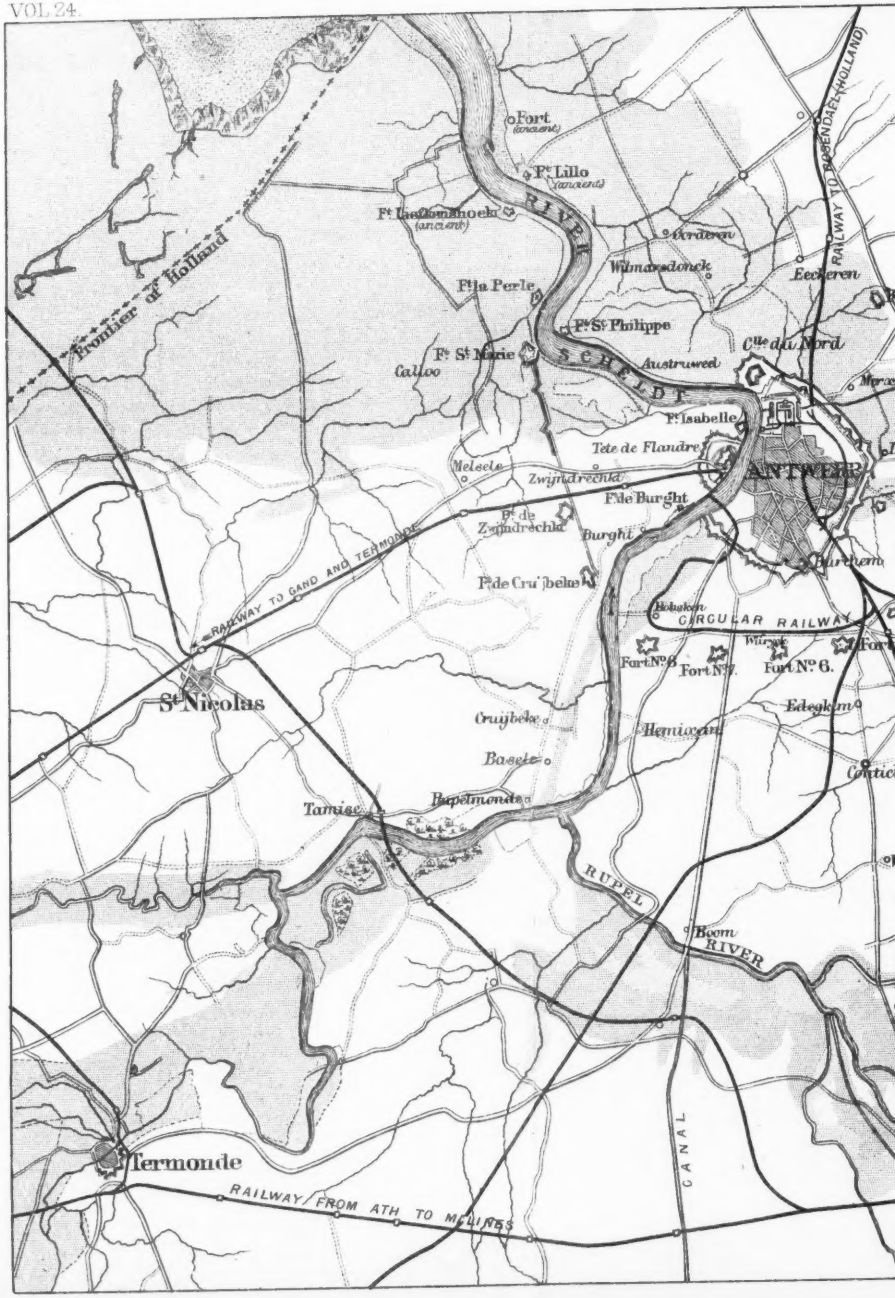
Similarly, *Diest*[2] bars the line Maestricht—Antwerp. It forms a double tête-de-pont, and permits the retreat of the Belgian Army behind the Demer, if beaten in an offensive action towards the line of the Meuse, and followed up in pursuit in the direction of Saint Trond. In most cases, its utility would be very slight, and if it were not for the fact that the works of Diest only date from 1838—that is to say, if they were not quite modern—the fortress would have been dismantled in 1859.

The fortress of *Termonde*, on the right bank of the Scheldt, with a small tête-de-pont on the left bank, is of the utmost importance. It covers the last bridge over the Lower Scheldt, and bars, in addition, several lines of railway, and amongst them the line from France, by Ath and Alost, to Malines. Termonde is also closely connected with Antwerp, from which it is distant only one day's march. It gives an army occupying the central "réduit" an opportunity of acting on the offensive as long as Antwerp is only invested on one bank of the Scheldt.

A fortress of the size of Antwerp cannot, from the nature of the circumstances, be continually kept up in a complete state of defence. According

[1] The question of constructing four new bridges over the Meuse at Wandre, Flemalle-le-Grand, Sclays, and Bas-oha, is now under consideration.

[2] The fortress of Diest, the construction of which was decided on in 1836 (in apprehension of a fresh invasion by the Dutch army), is now only of secondary importance; if it did not already exist there would be no thought of its construction.


Fort
(ancient)
Ft Lillo
(ancient)
Ft Lieftenambocke
(ancient)
Frontier of Holland
RIVER
RAILWAY TO FLUSHING & HOLLAND
Ordam
Wilmarsdonck
Eecheren
Ft la Perle
Ft St Philippe
Ft St Marie
Calloo
SCHELDT
Austruweel
Cte du Nord
Ft Isabelle
Tete de Flandre
ANTWERP
Melsele
Zwijndrecht
Ft de Burght
Ft de Zwijndrechte
Burght
Burchem
RAILWAY TO GAND AND TERMONDE
Ft de Cruibeke
Ekeren
CIRCULAR RAILWAY
Fort No 8
Fort No 7
Fort No 6.
St Nicolas
Cruibeke
Hemixem
Edeghem
Basele
Tamise
Bapelmonde
RUPEL
Boom
RIVER
CANAL
Termonde
RAILWAY FROM ATH TO MALINES

ANTWERP

AND ITS DEFENCES.

1880.

Stanfords, Charing Cross WC

to Brialmont, it would take at least fourteen days to place it in a state to make such a resistance as might be expected from it. As it is situated at a distance of only four or five days' march from the south and east frontiers, there is the danger in case of a sudden outbreak of war, that the enemy might make his appearance before it, when the preparations for defence, and even the concentration of the Belgian troops, would be still incomplete.

To guard against this eventuality, it would be necessary to obstruct the march of the enemy, and this is easy by reason of the natural advantages of the position of Antwerp.

In front of the southern part of the intrenched camp—that is the portion most exposed to attack—is found at about 15 kilos. from the fortifications, a "terrain" which lends itself easily to defence for a short time. This line is formed by the Rupel, the Lower Dyle, and the Nethe. These small rivers, the banks of which can, without exception, be inundated in a few days, would constitute serious obstacles, for they can only be crossed at a few points. These points would be closed at once by field-works, even if permanent works[1] for that purpose were not completed.

In this way, a quadrilateral of 73 kilos. in perimeter might be formed to the south-east of Antwerp, covered on all sides by accidents of ground offering obstacles to attack. The west side is covered by the Scheldt; the south by the Rupel[2]; the east by the Nethe; and the north by the canal joining the Meuse and Scheldt, and a great number of small lateral streams to the Nethe, which have marshy banks. Three of the angles of the quadrilateral are occupied by Antwerp, Lierre, and Malines; whilst in front of the fourth angle is Termonde.[3] Their position gives to the above-named towns a great strategical importance, the more so as they are important junctions of lines of railway.

Antwerp and Termonde are fortified. Lierre has old works partially demolished, but easy of repair. *Malines* alone is quite open. This last fact (Malines undefended) strikes one particularly, if it be considered that Malines offers great advantages to an enemy attacking Antwerp: since he would find there not only stores and railway works, but also great numbers of barges and boats, which could be utilized for throwing bridges across the Rupel and the

[1] In the legislative sitting of 28th March, 1878, the Chamber of Representatives voted a special credit of 3,000,000 francs for the construction of two permanent forts in advance of Lierre and Waelhem, on the left bank of the Nethe.

[2] It has been declared necessary by Government to construct a citadel at Rupelmonde, but the 3,420,000 francs special credit for these works has never been demanded. (Séance legislative, 22nd March, 1878.)

[3] The following are the advantages claimed by General Brialmont for the quadrilateral in question:—

(1.) The army safe behind the Nethe covers the centre of the country, while Malines and Termonde are only distant half a day's march from Brussels, Alost, and Ghent.

(2.) The young troops will be able to feel the enemy without being committed to an engagement.

(3.) The General-in-chief will be able, if necessary, to accept battle without running the risk of having to surrender, or be cut off from his last resort, Antwerp.

(4.) In the meantime the Commandant of Antwerp will be able to put the place in a perfect state of defence, and to collect the resources of the rich country to the north of the line Lokeren, Termonde, Malines, Lierre, Herenthals. The principle of an active defence of the Meuse or the Sambre from the commencement of hostilities is absolutely opposed. The following is recommended in preference: Until the general situation becomes defined politically and strategically, the Belgian army should remain on the watch, and not quit its base of operations, which is Antwerp. —*Belgien als Kriegsfeld: card v' Widdern.*

Nethe. Besides which, several good roads lead from Malines to Boom, Antwerp, and Lierre, so that we may make certain the enemy would use this town as a base of operations against Antwerp. He would establish at Malines his magazines of provisions, hospitals, &c., and would most probably surround the town with hasty works of defence, to protect it from the attack of the Belgian Army, if he were compelled to cease for a time the siege operations against Antwerp.

The Commission of 1852, which was intrusted with the task of laying down the basis on which the system of defence of Belgium was to rest, unanimously agreed that it was necessary to protect by field-works the defile of Malines. As the necessary works for the defence of a position so extended and important would require much time to construct, it is urgently hoped in Belgium that measures will be taken in time of peace to complete the defence of Malines, and also of Lierre.

Further, Malines is a salient in the line of defence formed by the Nethe and Rupel; suitably guarded, it would prevent the enemy attacking in force the "tête-de-pont" which would be thrown up at the last moment near Boom and Duffel. In conjunction with Lierre and Termonde, it would facilitate any offensive movement which the Belgian Army might undertake, on a favourable opportunity, against the enemy's flanks. Putting the Rupel and the Nethe in a good state of defence would also in a great measure ensure the safe retreat of a Belgian Army from the frontier to Antwerp.

The Position of Antwerp.

The position of Antwerp includes the following works of defence:—

a. The continuous enceinte enclosed partly by the inundation and the "citadelle du Nord."

b. The forts of the intrenched camp on the right bank of the Scheldt.

c. The works on the left bank of the river.

d. The works which defend the river and the docks.

A. *The Enceinte and "Citadelle du Nord."*

The enceinte, at a distance of 1,500 and 2,000 mètres from the old town, encloses the suburbs of Dambrugge, Saint Wildebrod, Borgerhout, Berchem, and Saint Laurent: it rests on the Scheldt to the south; and on the "Citadelle du Nord" to the north; and has a total length of 11,500 mètres, presenting only two prominent salients, the one near Berchem, the other near Deurne.

The eleven fronts, of which the enceinte consists, have each a length of 900 to 1,100 mètres; they are not revetted, and are protected by a wet ditch about 60 mètres in width. The dispositions for defence have been regulated by a consideration of the difficulties of attack. The four northern fronts, which are protected by inundations from a regular siege, are not so strong as the others; with the exception of a caponnière in the ditch, with a parapet for infantry, they have no works in front, except a covered way and defensible glacis, and an exterior ditch. The seven other fronts, which it was necessary to construct, so as to resist a regular siege, are much stronger. In front of the centre of each of these fronts, and surrounded by water, is a large caponnière, with a double tier of casemates, and an upper battery, flanked by low level batteries, and protected in front by a counterguard. The counterguard is protected from the ravelin by a dry ditch, with a "batterie "de revers" (casemated) in the salient, and a wet ditch, 50 mètres wide. The ravelins in front of the two fronts of Berchem, which from their situation are most exposed to attack, are in the form of lunettes: they are also larger and pushed further to the front than the others. The whole enceinte is surrounded by a covered way, with salient and re-entering places d'armes,

provided partly with casemated "réduits" and reverse batteries. In addition, in the centre of six of these fronts are built, on the natural earth, defensive barracks for 1,200 men (each), with earthen batteries above. At the salients are high cavaliers, and traverses of various kinds, for protection against ricochet and enfilade fire.

The "Citadelle du Nord" sweeps the Scheldt and the inundations in advance of the northern fronts. It also allows the garrison to retire to the left bank of the Scheldt, as soon as it is considered necessary to give up the resistance on the right bank, without molestation from the enemy during the retirement. With this view it is proposed, in case of siege, to throw bridges over the Scheldt, between the citadel and Fort Ste. Marie, at a sufficient distance from the north fronts to prevent the enemy from bringing artillery to bear on the columns during their passage across the river; and to inundate, at the last moment, the ground lying betwen the citadel and the town. This ground, at high water, is 2 mètres below the level of the Scheldt; the water for inundation is introduced by the lock which is the means of communication between the Scheldt and the Vosse-Schijn. The enemy, to follow up the pursuit in a direct line, would be then obliged to force his way past the forts on the north fronts.

The "Citadelle du Nord" has five exterior fronts, each 300 to 400 mètres in length; the gorge in the form of a tenaille. One of the exterior fronts sweeps the Lower Scheldt, the other commands the anchorage. The other fronts sweep the inundation and the polders[1] of Austruweel and Wilmarsdonck, and also the Scheldt in part. The fronts of the gorge command the neighbouring fronts of the main enceinte. The citadel is surrounded by a broad wet ditch, which communicates with that of the enceinte. The defence of the ditch is by small caponnières in advance of the salients. In front of the exterior fronts there is also a covered way and ditch.

The northern inundation encloses the polders of Wilmarsdonck and Austruweel, and extends to the eastward beyond the Rozendael (Holland) line of railway. The water of inundation is obtained at high tide from the Scheldt, by means of locks near the "Citadelle du Nord"; being in this way carried into the outer ditch, it covers the land, which lies at from 1 to 3 mètres above high-water mark.

If necessary, the northern inundation might be extended beyond the "digue" of Wilmarsdonck, and, very probably to the Dutch frontier.

By diverting the Great and Little Schijn another inundation could be made near Deurne, in advance of the east fronts, which would undoubtedly extend all along these little streams, as far as Wijneghem. This inundation, which would require a particularly high tide, would probably be of little importance.

Lastly, it is possible to spread a small inundation over the polder of Hoboken, in advance of the front which borders the Scheldt, on the south; the water for this inundation would be obtained at high-water from the Scheldt, by means of a lock close by.

B. *Intrenched Camp.*

The intrenched camp which extends to the south and east of Antwerp is covered by nine forts, including that of Merxem on the left flank, still unfinished. These forts are distant from the enceinte 3,000 to 4,000 mètres. The villages of Hemixem, Edeghem, Hoven, Bouchout, Vremde, Wommelghem, and Wijnighem, situated at distances varying from 1,200 to 2,000 mètres in front of the actual forts, prevented these detached forts being constructed further to the front.

The action of artillery would have been too much impeded by these

[1] Low lands subject to inundation.—Tr.

villages, while as they exist at present the forts have a range in all directions of 1,200 to 2,000 mètres. The only exception is the elevated fort (No. 4) between the Malines and Lierre lines of railway, which is unfavourably situated in this respect, as the village of Moortsel is only 700 mètres distant from its front. The extension of the intrenched camp towards the south and east would also have necessitated the construction of a greater number of forts, and would lead to a very great increase of expense, already very considerable.

The distance between two forts, from centre to centre, is on an average 1,900 mètres. The two northern forts (that in advance of Deurme and that in front of Merxem) are distant one from the other about 6,000 mètres. To remedy this disadvantage it is intended, in case of war, to defend with field-works the village of Schooten,[1] which is about midway between the forts.

The fort on the extreme right is on the bank of the Scheldt, that on the extreme left rests on the northern inundation. The nine forts together occupy a line 22,000 mètres in extent.

Each of the forts has an exterior front, two lateral fronts, and a gorge broken outwards, the whole surrounded by a broad wet ditch. The front ditches, and the lateral ditches, are flanked by caponnières; at the gorge is a casemated réduit with dry ditch. Round each of the forts there is in addition a covered way, of which a portion is arranged to receive field artillery. Some of the forts have a command of 10 mètres, the advantage of which is, that in selecting their positions, there was no need to restrict the choice to the highest points of the terrain. Thus has been obviated the necessity of taking possession of manufactories and country houses, which would have caused extraordinary outlay.

In rear of the line of forts, a circular railway will be constructed, connected by three lines with the town.

There is a design also to construct three small redoubts in advance of the fort of Merxem, on the digue of Wilmarsdonck. These will sweep the northern inundation, in conjunction with Fort Merxem and Fort St. Philippe, which is on the bank of the Scheldt, and will prevent the enemy from getting at the town by crossing the inundation in boats.

C. *Works on the Left Bank of the Scheldt.*

The ground immediately opposite the town, and which is close to the anchorage of the Scheldt, as well as the lands lying close to the river more to the north, are of sufficiently low level to be inundated with ease, either by opening the locks or by cutting the "digues." As the ground to the south, between the villages of Burght and Melsele, rises rapidly, and as on the other hand the chance of bombardment of the town, and especially the port, from this side must be admitted, it was evident that to defend the left bank, the old fort near the Scheldt at the "tête-de-Flandre" was inadequate. Two new forts (Cruybeke and Zwyndrecht) have therefore been built in advance of the villages Burght and Zwyndrecht; they are connected by a defensive digue with Fort Ste. Marie, which is on the bank of the river at the back of Calloo. Fort Ste. Marie thus forms the "point d'appui" of the right of the intrenched camp on the left bank, and contributes at the same time to the defence of the stream; it has recently undergone important alterations which are not yet complete; the forts in advance of Burght and Zwyndrecht, and the defensive digue are also unfinished. These forts on the left bank which make the circumference of the detached works up to a total

[1] It is most probable that Government will bring in a bill for the erection in advance of Schooten of a fort equal in strength to those of Lierre and Waelhem, to fill up the gap now existing between Fort No. 1, called Fort Wyneghem, and Fort Merxem.

of 45 kilos., are at a distance of about 6,500 mètres from the west side of the town.

The defensive digue is to serve also as a "chaussée d'inondation" so as to leave intact the polders of Melsele and Borgerwert, which have a superficial area of about 2,000 hectares: the object being to keep on the left bank a tract of land suitable for enclosing the cattle required for the food of the army and inhabitants, and also for encamping a portion of the defending troops. A railway is to be constructed along the inner side of the digue.

The fortified camp on the left bank of the Scheldt gives to the central réduit of Antwerp a fresh value strategically. It will allow the garrison to operate on either bank, and to cover its communications with Termonde, as well as with the rich country of Waes; it makes defence possible after the fall of the works on the right bank,[1] and facilitates the junction of an English, Dutch, or French army of relief with the Belgian army concentrated in the position.

D. *Works for defending the Stream.*

The defence of the stream below the town was formerly confined to Forts Lillo and Liefkenshoek; to the batteries of La Perle and Ste. Marie, higher up in the reach of Calloo; and to Fort Philippe opposite Calloo on the right bank. These works were no doubt sufficient to stop the approach of wooden sailing vessels, but they were entirely inadequate to cope with iron-clad fleets and steamers, against the advance of which it is necessary to provide by concentrating the fire on one point. Fort Lillo and Liefkenshoek have therefore been given up, and great improvements have been made to the works at Calloo. The river-side battery Ste. Marie is turned into a fort; whilst at the same time the battery of La Perle and Fort Philippe have been transformed into cupola forts; they are still unfinished.[2] In addition, it is intended in time of war to barricade the stream between Ste. Marie and St. Philippe, while a river-side battery would be thrown up between Ste. Marie and La Perle. The forts in advance of Hoboken and Burght are destined for the defence of the Scheldt above the town; it is proposed also to barricade the stream in time of war opposite Fort Burght.

Other Forts and Fortresses.

(1.) The fortress of *Termonde* (9,000 inhabitants), at the confluence of the Dendre and the Scheldt, consists of two parts, viz., the bastioned enceinte of the town on the right bank, and a small tenaille "tête-de-pont" on the left bank of the Scheldt. It may be surrounded by an inundation, which would not, however, in any case extend far to the south. On the left bank of the Scheldt, between the road to Hamme and the line of railway to Lokeren, the ground is left dry, so as not entirely to prevent the approach of the Belgian troops from that side. If we recall the important *rôle* which has been assigned to this fortress (*vide supra*), Termonde has great defects. First, want of space would prevent the assembly of any force of consequence; and secondly, the total absence of detached works prevents the offer of efficient shelter to troops retreating, or the resumption of the offensive on favourable terms. Termonde has but one exterior work; it consists of an elevated lunette on the right bank, which protects the railway station. The bridge head on the left bank only covers the gorge of the place and the bridge over the Scheldt in a very incomplete manner.

[1] It stands to reason that for an obstinate defence of this kind, the most extraordinary moral qualities would be required of the army.—AUTHOR'S NOTE.

[2] Fort Philippe is completed and armed, La Perle will probably never be finished.—TR.

If it were desired to give to Termonde the attributes of a fortress of offence, it would be necessary to construct detached forts on both banks of the Scheldt.

(2.) The small fortress of *Diest* (8,000 inhabitants) is astride the river Demer, and forms a double "tête-de-pont" at that point. It was completed in 1838 (when the political situation seemed to point to a Dutch invasion), and comprises a bastioned enceinte with wet ditches, some exterior works on the eastern and southern fronts, a citadel in advance of the west front, and a small battery (Fort Leopold) in advance of the north front.

The fortress of Diest could not hold out for any length of time; it is entirely commanded by the citadel, the trace of which is defective, as it does not completely sweep the ground in front, and is dominated by five or six neighbouring heights.

(3.) *The frontier forts of the Meuse* are the *citadel and La Chartreuse, near Liége*, and the citadel of Namur.

The citadel of Liége is on the left bank and that of La Chartreuse on the right bank; the former has an elevation of 112 mètres, the latter of 105 mètres, above the level of the Meuse; they are seen into from the surrounding heights. The citadel of Namur is situated to the south of the town on the plateau between the Meuse and Sambre. None of these three works satisfies the conditions required at the present day in frontier or delaying forts.

To the above may be added the fortress of *Huy*, which, although dismantled, is admirably planned, in good order, and easily armed.

Composition of the Belgian Army on a War Footing.

(*Revue Militaire de l'Etranger, No.* 509.)

There has just appeared in Belgium an "Aide-mémoire," for officers of the Infantry, drawn up by a Committee of eight officers, by the order of Lieutenant-General Boucher, commanding 2nd Division of Infantry.

The "Aide-mémoire" contains a table of the composition of the Belgian army on a war footing. This table is reproduced below, with a few observations to indicate the difference between the composition of the Belgian army on a war footing as contained in our last number, on the authority of a Dutch officer, and that issued by authority in the Belgian army.

This organization agrees pretty nearly with that which we have given; the differences to be noted are:—

1st. The corps artillery includes only *seven* mounted batteries instead of eight; the batteries left "disposable" by the corps d'armée being the reserve and depôt batteries Nos. 9, 10, 20, 29, 30, and 40.

2nd. The 5th Division does not include a battalion of Rifles, and the units of which it is composed are not the same as those given by the Dutch officer whom we quoted.

3rd. The regiments of Lancers, instead of forming with the 5th Division the general reserve of the army, constitute the independent cavalry of the Field Army.

4th. The eventual formation of a *sixth division* with the 4th battalions, following on the mobilization of the civic guard, is not noticed in the Aide-mémoire.

As a complement, to a certain degree, of the account of the Belgian army on a war footing, we annex from the Aide-mémoire the following details relative to the supply of Infantry ammunition.

The Belgian Infantry soldier carries on his person 60 rounds; in the battalion carts there are 22 rounds per man; and in the ammunition columns 69 (79 for the Rifles). Total, 151 or 161 per man.

The battalion cart contains 20,000 rounds, and has six horses.

Field Army.	Divisions.	Infantry. Brigades.	Infantry.	Regiments of Cavalry of 4 Squadrons.	Artillery.	Companies of Engineers.	Auxiliary Services for Divisions.	Auxiliary Service for Corps d'armée.
1st Corps	1st	1st	1st Battalion Rifles, 1st and 2nd Line	1st Chasseurs	1st, 2nd, 3rd, and 4th Mtd. Batteries	1st ..	1 Col., 1 Col. Artillery, 1 Ambulance Col., 1 Commissariat Col.	Telegraphists, Pontoniers, Armourers, 2 Columns Infantry, ammunition, 2 Columns Artillery, 2 Columns Commissariat, 1 Engineer Park, 1 Ambulance Park, 4 Columns Field Hospital Gendarmerie.
		2nd	3rd and 4th Line					
	2nd	3rd	2nd Battalion Rifles, 5th and 6th Line	2nd Chasseurs	5th, 7th, 8th, and 9th Mtd. Batteries ..	2nd ..	Do..	
		4th	7th and 8th Line ..	.. .. ..	11th, 12th, 13th, 14th, 15th, 16th, 17th Mtd. Batteries, and 18th and 19th H.A. Batteries			
2nd Corps	3rd	5th	3rd Battalion Rifles, 9th and 10th Line	2nd Guides ..	21st, 22nd, 23rd, 24th Mtd. Batteries	3rd ..	Do..	
		6th	11th and 12th Line					
	4th	8th	4th Battalion Rifles,	1st Guides ..	25th, 26th, 27th, 28th Mtd. Batteries ..	4th ..	Do..	
		9th	1st and 2nd Chasseurs 3rd Chasseurs and Grenadiers	.. .. ..	31st, 32nd, 33rd, 34th, 36th, 37th, Mtd. Batteries, 38th and 39th H.A. Batteries			
Independent Cavalry		1st	.. ..	1st & 2nd Lcrs.				
		2nd	.. ..	3rd & 4th Lcrs.	H.A. Batteries ..	.. ..	2 Ambulance Cols.	
Army of Antwerp 5th Field Division	..	7th	13th and 14th Line ..	Reinforcing Squadrons	Reserve Batteries when armed.	This division can eventually join the Field Army. The army of Antwerp will include, besides the 4th Battalions required for the defence of the forts and enceinte, the reinforcing squadrons, and all the Engineers, Siege Artillery, &c., which are stationed in the intrenched camp and its dependencies.		
	..	8th	Six 4th Battalions ..	.. .. ..	.. .. ..			

The Infantry ammunition column includes 23 wagons, of which 21 are ammunition wagons (one for the cavalry), 1 battery cart, and 1 field forge.

The *personnel* of this ammunition column comprises 3 officers and 138 men (99 of the Train, 14 of the Artillery, and 25 Infantry); the horses number 153, of which 140 belong to the Train, and 13 are saddle.

THE QUESTION OF REPEATING RIFLES.

By Captain Walter H. James, R.E.

In a former number of this Journal,[1] we gave a short account of the then state of this question. Since that date further experiments have been made, and it is now admitted by the great military Powers, that the expense alone it is which prevents the adoption of these weapons.[2] Recent information would, however, seem to point to the fact that the great advantages to be derived from their introduction will be eventually considered to overrule this objection, and that before long we shall find European armies following the example set them some years ago by Switzerland, and arming their infantries with some form of magazine weapon.

At the present moment, in addition to this last-named country, we find that in France the Navy have adopted the Kropatschek, while the Norwegian Navy has the Krag-Petersen. The United States are introducing the Hotchkiss.[3] In Austria an extensive series of experiments has been conducted with the Kropatschek and other repeaters, which resulted in a victory for the former, and a certain number have been issued to a battalion of rifles in order that a more extended series of trials may be undertaken. In Italy a repeater, known as the Vetterli-Berthelot, has, after experiments with it and other rifles, been issued for trial to some of the Bersaglieri. In Russia a very long series of experiments has been conducted, which will probably result in the introduction of some form of magazine weapon. In France, it appears possible that the Kropatschek, which takes the same cartridge as the Gras rifle, may be introduced for the army as well as the navy, while in Germany recent experiments seem to show that the Mauser will be converted into a repeater. Lastly, we may say that in England experiments are being conducted with weapons of this class.

It seems, therefore, certain that within the next few years we shall see the infantries of Europe armed with magazine rifles. Still the cost of furnishing new weapons by the million for an army of the size of those now kept on foot on the Continent is so great that at first we must expect some compromise to be introduced. Thus, in Russia, the Krnka quickloader has been introduced, although the Committee charged with the experiments conducted with various forms of repeaters reported strongly in favour of the adoption of Evans' magazine rifle, which they suggested should be issued to good marksmen. In Germany experiments have been conducted, with a view to the introduction of some form of apparatus which might be fixed to the Mauser rifle, and thus enable it to be used as a repeater. More than one suggestion has been essayed, but that which seems most likely to be adopted is that proposed by the firm of Louis Löwe and Co.

[1] See vol. xxii, page 1091, *et seq.*

[2] See "*Militair Wochenblatt*," 24th July, 1880. This paper is the organ of the Prussian Staff.

[3] See, for description of these weapons, the article before alluded to in vol. xxii.

It consists of a box made of light steel, weighing about 12 ozs., and which holds eleven cartridges, placed in a row side to side and one above the other. The box is fixed underneath the bolt-chamber; when the bolt is drawn back a cartridge comes up into the chamber and is pressed forward into the breech by the forward motion of the bolt; when the supply from the magazine is exhausted, the arm can still be used as a single loader. The magazine itself can be carried either attached to, or separated from the arm, and is so arranged when fastened to the arm, where it is held in its place by a spring, that the supply of cartridges from it can be cut off at any moment. It seems probable that this modification will be introduced for all the Mauser rifles, although at the same time experiments are being conducted, with various types of repeating rifles, before a final decision is arrived at.

The system proposed by Messrs. Löwe would seem to be much the same as that invented by Lieutenant Lee, of the United States Army. In the Lee repeating rifle the magazine can be attached or detached at will; it is placed just in front of the trigger-guard, holds five cartridges, and weighs only 3 oz. The rifle can be used as a single loader, and, when wanted as a repeater, the magazine can be attached by a simple movement. It is impossible to give a written description which would fully explain the mechanism of this rifle, but it seems particularly worthy of attention from its very great simplicity and the solidity of all its parts, and from the fact that it can be used either as a repeater or as an ordinary breech-loader. It may be well, also, to draw attention to the fact that, from the the way in which the cartridges are carried in the magazine, the bullets are not liable to suffer the alteration in shape which they may do when carried in the long tube which forms the magazine of most repeaters.

The Evans repeater, which has been so favourably reported on in Russia, presents the peculiarity of carrying more cartridges in its magazine than any other form of repeater. The magazine is in the butt and holds twenty-six cartridges. They are arranged round a central stalk, and are moved forward by an Archimedean screw against which the bases of the cartridges rest. The breech-bolt, when drawn back, causes this screw to revolve and push the cartridges forward into the chamber, whence they are pushed into the barrel by the breech-bolt. The Russian Committee on the subject of repeaters considered the Evans to be the best type presented to them for trial.

From the foregoing pages it will be seen that, in the opinion of every military Power of the first rank, the repeating rifle is the weapon of the future.

REVIEWS AND NOTICES OF BOOKS.

IMPERIAL FEDERATION AND CANADIAN DEFENCE.

THE withdrawal of regular troops from the great Colonies has naturally limited the opportunity formerly afforded to Officers of the Army of becoming acquainted with the military interests and aspirations of the colonial subjects of the Queen. The greater portion of our Empire is now a *terra incognita* to the serving Officers of the Imperial Army, and the military aims and efforts of rising British peoples are more or less concealed under masses of other matter in Colonial Blue-books, which never find their way to the shelves of the ordinary military library. It may, therefore, serve a useful purpose to draw

attention here to such articles on military subjects as appear from time to time in colonial periodicals, which can be easily obtained. In the May number of the *Canadian Monthly* will be found an article bearing the title which stands at the head of this notice, written by Lieutenant-Colonel Salter Jarvis, Queen's Own Rifles (active militia of Canada). It was originally read as a paper before the Militia Institute, Toronto, and gives an insight into the present and probable relationship between the mother country and the Dominion. While deploring the conspicuous absence of definite mutual arrangements between the parent State and its great offshoot, it unavoidably enters into those political considerations which are the foundations of this question, and must necessarily be excluded from examination in this Journal. A few extracts will, perhaps, best convey the general view taken by this Officer respecting that portion of the subject specially relating to Canadian defences.

"A contemplation of the defenceless state of Montreal should convey to "Canadians a sense of humiliation." . . . . .

"Tardy steps, it is true, have been taken to mount some rifled ordnance "upon the fortifications of Quebec, to convert, at Montreal, under the Palliser "system, some of our old smooth-bores, and to establish at Quebec a factory "for the manufacture of small arms and ammunition, but on the whole, in the "item of warlike stores and *matériel*, what a poverty-stricken aspect does the "country present! There has been as yet next to no attempt to utilize the "invention of torpedoes in the defence of our coasts and harbours, or to "organize the splendid material afforded by our mercantile marine for the "protection of our commerce in case of need." . . . . .

"In the militia, the only re-assuring feature is the inborn soldierly "instincts of the force, and the persistent faithfulness and tenacity with "which it has held together under circumstances calculated to dishearten the "most sanguine."

The author condemns, in strong language, the annual "folly of endeavouring "to train 40,000 men on a sum barely sufficient for 10,000 or 12,000," and here his opinion is authoritatively confirmed by the official reports of Sir Selby Smyth, on the "State of the Militia of Canada."

"By all means," says our author, "assuming that the grant for militia "purposes cannot be increased, let the force be reduced in numbers; let an "efficient Staff, a system of commissariat supply and ambulance, be organized; "let facilities be afforded to Officers and non-commissioned officers, of all "branches, of acquiring the higher attainments indispensable to their keeping "pace with the times; and, above all—and this cannot be pressed with too "much insistance—let divisional and brigade camps be the rule and not the "exception; not such as were held in the past, where we marched, counter-"marched, and marched home again, 'where pomp and circumstance' were the "great *desiderata*; but practical work-a-day camps, where both Staff and "regimental Officers would have opportunities of putting into practice what "they should have attained some insight into before receiving their appoint-"ments."

The chief suggestion, as a practical remedy for defects in the training of the militia, is to organize "principally the city and town corps, whose "opportunities of assembling for drill and of acquiring the rudiments of "training are more extended," into "brigades and divisions, with a proper "Staff complement," and "to train, for at least twenty days in each year "(eight at headquarters and twelve in camps of instruction) one-half annually "of this portion of the militia." Colonel Salter Jarvis proposes to enrol, arm, and equip the rural militia, but only to issue the arms and equipment "upon occasions of training," which, he says, "might be every third year." He would, however, attach the Officers and non-commissioned officers of the rural militia to the divisions and brigades of the city and town corps, during

the twenty days' annual training. These city and town corps he calls class A, the remainder class B, and he recommends "that the portion of class A which "did not, in any given year, attend a camp of instruction, should put in, say "twelve days, at battalion headquarters."

It is impossible to criticize these proposals fairly, because no information is given as to the probable strength of class A or class B, nor is any estimate whatever given of cost. No doubt the author has, for his own guidance, assumed some basis of calculation which he has, perhaps from want of space, withheld from his readers. It would, however, appear that he contemplates training some 10,000 of class A annually, and attached to this would be, as we understand the proposal, the whole of the Officers and non-commissioned officers of class B. In the absence of more detailed information, it is difficult to see how so overwhelming a proportion of Officers and non-commissioned officers could, under such circumstances, be efficiently instructed or really usefully employed, during twenty days' training. The condition and efficiency of the Canadian portion of Her Majesty's forces is a matter of grave importance. Such papers as that we have here briefly noticed should command the serious attention and ready sympathy of all who are not absolutely blind to the great extent and rapid growth of Canada and other Colonies, and who, therefore, recognise the relatively increasing necessity for combination and reciprocity in naval and military arrangements between the several parts of our Empire, if it is in the future to maintain that position which, in totally different circumstances, it won in the past.

J. C. R. C.

Die Tachymetrie. By Captain Joseph Ceipek, of the Austrian Engineer Staff. 1879. Vienna: Pamphlet. Pp. 40. Price 1*s.* 6*d.*

THE method of surveying advocated in this pamphlet is so called from the tachymeter, the instrument with which it is carried out. This instrument enables the surveyor to fix the position, both horizontal and vertical, of any point with reference to that on which the instrument stands, without chaining or other direct measurement.

Instrument.—The instrument is arranged both for horizontal and vertical angles, and is provided with a large and sensitive compass needle. It is provided with a powerful telescope, magnifying 24 or 25 fold, in which are fixed three horizontal wires, the central one cutting the axis of the telescope at right angles, the outer ones equidistant from the central wire. When the telescope is directed on a stave held upright at any point whose position it is intended to determine, the two outer wires will subtend on the stave a length which is proportional to the distance of the stave from the instrument. The staves are graduated to a scale such that one division represents one metre. This is done by setting the staves up at known distances of 50, 100, &c., metres, and measuring the length of stave subtended at these distances by the two outer wires. In order to obtain the distance, the readings of the upper and lower wires are taken, and their difference will give the required distance. The middle wire is used when for any reason only a small part of the stave is visible. The distance thus obtained is the oblique distance between the instrument and the stave. The horizontal and vertical angles are now read off on the instrument, and this enables the correct horizontal distance between the two points to be determined, also their relative height and position with reference to the magnetic or any other required meridian.

System of Working.—The tachymetrical system of surveying is based on triangulation, and on a general system of levels. The pamphlet states that

the survey should be preceded by triangulation of the third or fourth order, based of course on a primary and secondary triangulation, and that the altitude of the triangulation points and of additional points, if necessary, not more than one kilometre apart, should be fixed by a careful system of levels. An accurate framework is thus provided on which the subsequent work is based.

The work is divided into field and office work.

Field Party.—A field party consists of one surveyor, two assistants, and two to four labourers. The surveyor superintends generally, selects the stations for the instrument and the points where the staves are to be set up, and makes a sketch in which he fills in all the necessary detail round the station. One of the assistants works the instrument, the other keeps the field book. The assistants change rounds occasionally.

Method of Surveying.—The work is carried out in the following manner :—The instrument is set up over a trigonometrical point, adjusted and directed on one of the staves held upright at a point whose position it is required to determine. The reading of the upper and of the lower wire is taken and entered in the field book. The horizontal and vertical angles are then taken, and the height of the instrument above the trigonometrical point is measured. The horizontal angle is measured from the magnetic or any other convenient meridian. These are all the measurements required, and supply all the data necessary for determining the position in space of the point it is required to fix. The stave is then sent to the next point, the same measurements are taken for it and entered in the field book ; and so on for any number of points which it may be desired to determine from this station. Such points should not be more than 400 metres from the instrument. The instrument is then moved forward to one of the points thus determined, and, after adjustment, is directed on a stave held upright at the back station. A fresh set of points is then determined from the new station. Whilst the instrumental observations and readings are being made, the surveyor makes a sketch of the ground, taking in each point which is surveyed, and showing all the detail required relatively to these points. In close work, such as houses, railways, &c., where large scale maps of the ground are available, these may be used, being, it is presumed, revised in a manner similar to what is known as examination on the ground on the Ordnance Survey.

Office Work.—The office work consists in completing the field book by calculating the oblique distance, making the necessary corrections to reduce it to the horizontal, and calculating the altitude of the forward point above the sea level or datum point. The form of the field book is simple and convenient. The calculations are short, and can be done by ingeniously constructed scales, for a description of which the pamphlet should be consulted. The drawing of the plans requires no special notice.

Sources of Error.—The pamphlet mentions four sources of error to which this method of surveying is subject :—

1. Incorrect reading of the stave, owing to the thickness of the horizontal wires, or to the staves not being held vertical. The thickness of the wire admits of distinguishing divisions representing ·5 metre at a distance of 350 metres. The errors due to not holding the staves vertical should be slight, as each stave is provided with a plumb-bob. The maximum error due to these causes at 400 metres, the greatest permissible distance, is stated to be ·6 of a metre.

2. Incorrect angular readings. Angles of the instrument can easily be read to 1′, and an error of that amount would, at a distance of 400 metres, cause an error of 0·068 metre only.

3. Wrong entries in field book. All systems of surveying are liable to this source of error. The pamphlet considers, it is not quite clear on what grounds, that these errors would generally be discovered during the drawing of the plans.

4. Errors in the office, mainly wrong readings of the scales used to save the labour of computation.

The result of several years' experience on fairly easy ground shows that ·3 square metre is a fair daily average for a section.

Advantages.—The advantages claimed for the system are :—

1. The combination of field and office work, which enables wet days to be economised, and reduces the monotony of the work.

2. Rapidity. The rate of progress is stated to be in the proportion of 300 to 116 relatively to that of the system previously in force in Austria.

3. Economy. It is stated that the cost of the survey has been reduced to 13,000 or 14,000 florins under this system, compared with 25,000 under the old. The same accuracy at least is claimed for the tachymetrical system as for any other which has been tried.

Remarks.—The system advocated is ingenious, and has the advantage of determining the heights at the same time as the horizontal distances. These latter being obtained instrumentally, the expense of chaining is saved. It is impossible from a written description to form a just opinion of this system of surveying. One or two remarks, however, may be made on it :—

1. The survey depends entirely on the instrument, and instrumental errors, such as wrong adjustment, would be fatal to accuracy. This source of error is not noticed in the pamphlet.

2. There does not seem to be any sufficient check on the accuracy of the work, such as is provided by the plotting of a chain survey, or interpolation on a plane table survey. The pamphlet states that the positions of the instrument should be fixed from several points, but it does not appear to be contemplated that any, except the more important detail points, should be so determined, and it is probable that if they were, the rapidity and economy of the system would be very much diminished.

3. The pamphlet is not very distinct as to the way in which detail is to be filled in. On the scale referred to ($\frac{1}{2880}$), it would require to be measured. This would be very slow work, and would probably, in some cases, delay the instrumental work. The surveyor thus employed would have very little time to devote his attention to the general progress of the survey, which, however, he is required to direct.

4. The detail appears to be drawn direct from the sketch made by the surveyor. No system is mentioned for checking or correcting the inaccuracies which must occur in doing so.

5. One of the advantages of the system is stated to be the economy due to the combination of field and office work ; but it does not appear in what way the labourers are utilized on days devoted to office work.

6. It may, I think, be safely inferred that the accuracy attainable under this system of surveying is less than that of a chain survey.

D. A. J., Capt. R.E.

Le Navisphère, Instrument Nautique. Par M. H. de Magnac, Lieutenant de Vaisseau. 1879. Paris : Berger, Levrault, & Cie. Pamphlet, pp. 21.

This instrument, which has been patented in France, England, and Germany, is merely a small celestial globe specially adapted for use on board ship. The old globe, with which we are familiar, has the equinoctial and ecliptic with their secondary circles marked upon it, and the visible stars depicted, the relative positions of which, however, are much obscured by the number inserted, and still more by the quaint pictures of mythological objects from which the constellations derive their names. M. de Magnac marks upon his small globe the equinoctial, the circles of declination, and the ecliptic ;

with the stars of the first and second magnitudes only, the divisions of the constellations being indicated by dotted lines. The object is extreme clearness, so that the globe may be of practical use by the light which is available at night on board ship. The other system of great circles which the purposes of navigation require to be combined with the equinoctial system is that of the horizon. In our old globes this is embodied in the wooden horizon, the brazen meridian, and the altitude quadrant. M. de Magnac fits this system to his globe differently. Instead of its resting in a framework, which represents this system, his globe is quite free, and can have applied to it a moveable appendage which he calls the "Metrosphère." This consists of a great circle, a secondary attached semi-circle, and a quadrant; one extremity of the quadrant (the vertical) works on a pivot from the apex of the semi-circle (the meridian), and the other extremity traverses the primary circle (the horizon). The inner edges of these arcs fit close to the globe, they are graduated and furnished with clamping screws. The whole—globe with metrosphère—may be placed upon a small circular stand and kept from rolling out by a spring arm furnished with a cap.

The spherical triangles of nautical astronomy can be roughly solved by the ordinary old-fashioned celestial globe on its stand. Any old book on the "Use of the Globes" gives the methods of working out all the ordinary problems; and instruction in the globe occupied a prominent place in standard works on navigation. We find a chapter devoted to it by Robertson, who remarks:—"The globes are fitted with certain machinery, "by means of which a great variety of useful problems are neatly solved."

A globe was ordinarily taken to sea, and the mariner dispensed with it only when rapid and accurate calculation became the custom, consequent upon the introduction of good logarithmic tables. Many have regretted the disuse into which this useful auxiliary has fallen on board ship. It furnishes a rational method of instruction for young officers; it renders the knowledge of the stars more easily acquired, and the use of night observations more familiar; it gives the means of obtaining approximations and data initiatory to taking observations; and, combined with the accurate indications of the chronometer, it may be made still more directly useful. We, therefore, congratulate M. de Magnac on his new globe. It is a simple and handy little instrument. As, with very little trouble in setting, it exhibits the stars which are above the horizon at any given moment, with their altitudes and azimuths, it will especially facilitate night observations and aid to render more habitual the practice of Sumner's method. It is with reference chiefly to what the French call "La Nouvelle Navigation Astronomique" that the "Navisphère" has been invented. In the French Navy it has been introduced into the "Borda" stationary training ship for naval cadets at Brest, the flag-ship of the Mediterranean squadron, and the four ships of the training flying squadron. It is constructed by M. W. Eichens, Rue Denfert Rochereau, 77, Paris;[1] and a description by the author is published by Berger, Levrault, & Cie., Rue des Beaux-Arts, 5, Paris.—J. B. H.

[1] Price of the instrument in England, 5*l*.